ATTACHMENT A

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UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

OREGON RIVERWATCH, Plaintiff	)	Case No. 06-CV-06246-AA
v.	)	
METROPOLITAN WASTEWATER MANAGEMENT COMMISSION, et al, Defendants	)	

MOTION TO APPLY STATUTORY 45 DAY REVIEW PERIOD BEFORE ENTRY OF CONSENT JUDGMENT

The United States made a good faith effort to resolve the following matter with plaintiffs' counsel, by telephone and electronic mail, before filing the following motion, and has been unable to do so. As set forth below, the United States requests that the Court defer entry of the proposed settlement agreement in this action for 45 days, as required by the Clean Water Act, until August 3, 2007.

This is a Clean Water Act citizen suit brought by a citizens group against the City of

Eugene, the City of Springfield, and the Metropolitan Wastewater Management Commission. The parties have entered into a settlement agreement, and have submitted it to the Court with a request that the Court enter a judgment of dismissal in this matter. The United States files this motion to request that the Court provide the statutory 45-day period for review of these materials by the United States Environmental Protection Agency (EPA) and the United States Department of Justice, pursuant to Section 505 of the Clean Water Act, 33 U.S.C. § 1365. The United States will therefore provide comments to the Court by August 3, 2007.

The Clean Water Act (CWA), 33 U.S.C. § 1251 et seq., and the Clean Air Act, 42 U.S.C. § 7401 et seq., both provide for private citizen suits, and have similarly worded provisions providing for service of proposed consent judgments on the Attorney General and the Administrator of EPA 45 days before such a judgment may be entered by the Court. See 33 U.S.C. § 1365(c)(3), 42 U.S.C. § 7604(c)(3). 33 U.S.C. § 1365(c)(3) states, in pertinent part: "No consent judgment shall be entered in an action in which the United States is not a party prior to 45 days following the receipt of a copy of the proposed consent judgment by the Attorney General and the Administrator." This provision is intended to allow the United States to review a proposed CWA consent judgment and offer its views to the Court before final resolution of the citizen suit case.

Plaintiffs in this action assert in a letter to the Court dated June 22, 2007 that, because they have prepared a document captioned a "settlement agreement," this 45-day period does not apply. As set forth below, this interpretation is inconsistent with the plain meaning of the applicable provision of the Clean Water Act. It is also at odds with the intended purpose of that

provision, which is to allow the United States an opportunity to review proposed resolutions of citizen suits to ensure that they are consistent with the public interest and the purposes of the applicable statute, and to offer its views to the Court.

Although the United States believes the governing law is straightforward, there are no decisions directly on point of which counsel is aware. Therefore, because of the significance of this issue and the possibility that a party might enter a settlement agreement without notifying the United States, the United States believes that judicial resolution of this matter is appropriate.

I. THE SETTLEMENT AGREEMENT ENTERED INTO BY THE PARTIES IS WITHIN THE PLAIN LANGUAGE OF THE CLEAN WATER ACT PROVISION PROVIDING 45 DAYS FOR UNITED STATES REVIEW OF "CONSENT JUDGMENTS"

The text of the Clean Water Act provides for the United States to receive a copy of any proposed "consent judgment." 33 U.S.C. § 1365(c)(3). Plaintiffs in this action have suggested that this term does not encompass the settlement agreement and proposed order of dismissal in this action. As explained below, the plain language of the Clean Water Act is to the contrary. That language provides: "No consent judgment shall be entered in an action in which the United States is not a party prior to 45 days following the receipt of a copy of the proposed consent judgment by the Attorney General and the Administrator." Id.

Black's Law Dictionary treats the phrase "consent judgment" as synonymous with "agreed judgment," a term that appears under "Judgment" and is defined as follows:

> A settlement that becomes a court judgment when the judge sanctions it. In effect, an agreed judgment is merely a contract acknowledged in open court and ordered to be recorded, but it binds the parties as fully as other judgments. Also termed *consent judgment*; *stipulated judgment*; *judgment by consent*.

Black's Law Dictionary (8th ed. 2004). (The term "consent judgment" is also listed under "Judgment," with the notation "see agreed judgment.")

The term "judgment," in turn, is defined for purposes of any civil action in federal court by Federal Rule of Civil Procedure 54 (a), which provides: "(a) **Definition; Form**. 'Judgment' as used in these rules includes a decree and any order from which an appeal lies." [1]

In this case, the parties have proposed that the Court enter an order of dismissal. An order dismissing a case is a quintessential example of an order from which an appeal would properly lie. Thus, that document is a "judgment." Further, as the parties' submissions make clear, the entry of this order would also be with the consent of the parties. It follows that the proposed order of dismissal is a proposed CWA "consent judgment," which is subject to United States review. In fact, the proposed order submitted by the parties is captioned "Judgment of Dismissal," which highlights this point.

The Court's review extends not only to the order of dismissal proposed by the parties, but also to the accompanying settlement agreement. As set forth below in Part II, the Court is required under the CWA to determine whether a proposed consent judgment is in the public

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[1] Notably, in drafting this provision Congress used the phrase "consent judgment" rather than "consent decree." The two phrases have overlapping meanings; Black's Law Dictionary defines the term "consent decree" under the term "decree." A decree is defined as follows: "(1) Traditionally, a judicial decision in a court of equity, admiralty, divorce, or probate . . . . (2) A court's final judgment. (3) Any final order, but [especially] one in a matrimonial case." As this definition indicates, the term "consent decree" often connotes a decree that incorporates ongoing equitable supervision. Congress's decision to instead use the phrase "consent judgment" suggests that such relief is not necessary to trigger the 45-day review provided by 33 U.S.C. § 1365(c)(3), and that an agreement that does not include such relief is nevertheless subject to review.

interest and meets other criteria. The Court could not effectively carry out that statutory function unless it reviewed the parties' entire agreement. Likewise, in order for the United States to effectively assist the Court, the United States must receive all documents accompanying the order of dismissal for review.[2] The settlement agreement is thus a necessary part of the consent judgment that the CWA requires must be submitted to the United States for review, and that is ultimately "sanctioned" by the Court's order.

In summary, a binding resolution of a Clean Water Act citizen suit is a "consent judgment" under the terms of the statute, and the review obligation encompasses all documents embodying that resolution.

II. CONGRESSIONAL INTENT IN ENACTING THE CITIZEN SUIT PROVISIONS WAS TO PROVIDE FOR JUDICIAL REVIEW OF SETTLEMENTS AND TO PROVIDE A ROLE FOR THE UNITED STATES

In Sierra Club, Inc. v. Electronic Controls Design, Inc., 909 F.2d 1350, 1355 (9th Cir. 1990), the Ninth Circuit explained the court's role in approving proposed consent judgments in Clean Water Act citizen suits. The Court stated that "because of the unique aspects of settlements, a district court should enter a proposed consent judgment if the court decides that it is fair, reasonable and equitable and does not violate the law or public policy." Id. (citing Citizens for a Better Env't v. Gorsuch, 718 F.2d 1117, 1125-26 (D.C. Cir. 1983)).[3] The

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[2] The proposed order in the present case provides: "The Eugene Division of the United States District Court of Oregon retains exclusive jurisdiction over any and all claims for enforcement of the Settlement Agreement between the parties." This demonstrates the close relationship between the order and the accompanying settlement agreement.

[3] See also Local No. 93, Int'l Ass'n of Firefighters v. City of Cleveland, 478 U.S. 501, 525-26 (1986) (citations omitted) ("[A] federal court is more than "a recorder of contracts" from whom parties can purchase injunctions; it is "an organ of government constituted to make judicial

Electronic Controls Design Court also cited to a Ninth Circuit case on the standards applicable to approval of class-action settlements, Davis v. City and County of San Francisco, 890 F.2d 1438, 1444-45 (9th Cir. 1989), indicating that, as with a class-action settlement, a court must satisfy itself that the resolution of a citizen suit is in the public interest before giving its approval to a particular settlement. Electronic Controls Design, 909 F.2d at 1355.

In addition to judicial oversight of consent judgments in CWA citizen suits, the Clean Water Act also provides a systemic role for the United States in monitoring citizen suit litigation. Citizens must give notice to the Administrator of EPA before bringing suit, 33 U.S.C. § 1365(b); they must serve a copy of any complaint on the Attorney General and the Administrator, id. § 1365(c)(3); the United States has the right to intervene in any such action as of right, id. § 1365 (c)(2); and there are two distinct provisions barring the initiation of a citizen suit in circumstances where a United States or State enforcement action is already underway, id. § 1319 (g)(6); § 1365(b)(1)(B). The Clean Water Act's provision requiring submission of proposed consent judgments to the Administrator and the Attorney General is just one part of a statutory framework providing limitations on citizen suit litigation.

These provisions have a number of important functions. They limit potential interference of citizen enforcement with ongoing State or Federal enforcement actions, and ensure that the United States is on notice of alleged violations and proposed remedial actions. The Supreme Court explained in Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Foundation, Inc., 484 U.S. 49, 60-61 (1987), that citizen suits are a "supplemental" and "interstitial" remedy, and that

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decisions." Thus, "parties may [not] agree to take action that conflicts with or violates the statute upon which the complaint was based.")

Federal and State enforcement is primary. Thus, the 45-day review period helps to ensure that the United States can effectively monitor citizen litigation.

The review period also allows the United States to take appropriate action if litigation or its resolution is inconsistent with the public interest or the purposes of the statutory scheme.[4] The legislative history of these provisions demonstrates that Congress specifically intended that the United States play this role in reviewing citizen settlements. At the time of the adoption of the 1987 amendments to the Clean Water Act, Senator Chafee stated that those amendments would allow the United States to object to any "abusive, collusive, or inadequate settlements." 133 Cong. Rec. S. 737 (daily ed. Jan. 14, 1987).[5] As the Court explained in Electronic Controls Design, following United States review, "[i]f it finds that the proposed judgment is not in accordance with the Act, the United States can object" to entry of the consent judgment. 909 F.2d at 1352 n.2.

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[4] The United States has a number of criteria it applies in its review. We do not address the application of those criteria here, as the full 45-day period will be required to provide the United States' views.

[5] Senator Chafee's use of the word "settlement" is also highly significant, as it indicates that Congress intended that the scope of review should be broad and would not be limited to documents captioned as consent decrees. In Gwaltney, the Supreme Court placed heavy reliance on a floor statement by Senator Muskie in construing the citizen suit provisions of the Clean Water Act, 484 U.S. at 61-63. Therefore it is appropriate to likewise give Senator Chafee's views considerable weight.

Just as a litigant cannot circumvent the 45-day review period through its choice of caption, a litigant may not do so by entering into a settlement agreement and then seeking to dismiss the lawsuit voluntarily pursuant to Federal Rule of Civil Procedure 41. That would still be a binding resolution that would be within section 1365(c). See also Fed. R. Civ. P. 41(a) (noting that such dismissals are "subject to . . . any statute of the United States."). No such issue is raised in this case because the parties have not proceeded in that fashion.

Although the Court is the ultimate arbiter of whether a particular proposed consent judgment is consistent with the public interest or the purpose of the statute, the United States has substantial expertise in the administration of the Clean Water Act. Therefore, United States review of proposed CWA consent judgments can be of substantial assistance to the Court in its determination as to whether to enter a proposed consent judgment.

Plaintiffs' proposed interpretation of the statute would defeat this carefully crafted statutory scheme. Under plaintiffs' approach, an accident of form or caption – the decision to frame a document as a settlement agreement rather than a consent decree – could prevent the United States from serving its intended function under the statutory scheme. That would mean that the Clean Water Act permitted private parties to structure their settlement in a way that would avoid governmental review under the Act. Congress could not have intended this result. On the contrary, instruments that purport to avoid United States review (whether intentionally or not) through this device may be particularly in need of close review by a third party.[9]

Plaintiffs' proposed interpretation is particularly unpersuasive because the distinction on which plaintiffs rely is more formal than substantive; for example, a document captioned as a settlement agreement may be just as enforceable by the court as a document with a different caption, depending on its terms. Indeed, the proposed order submitted by the parties in this case appears to contemplate judicial enforcement of their settlement agreement. That provision further underlines that this is a consent judgment, irrespective of the label attached to it by the

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[9] In interpreting another aspect of a scheme providing for citizen suits, the Ninth Circuit has said that it will not "attribute to Congress an intent to enact a provision after hours of debate that could be evaded by every potential plaintiff, thus rendering it meaningless." Hallstrom v. Tillamook County, 844 F.2d 598, 601 (9th Cir. 1987), aff'd 493 U.S. 20 (1989).

parties.

United States review may be particularly helpful to the Court in light of the nature of this action. The complaint in this case involves a number of alleged violations relating to the storm water collection system of a large municipal area. The United States has ongoing enforcement initiatives for municipal sewer systems and stormwater, and therefore has significant expertise as to the resolution of such actions.[1] Settlements in such matters are frequently highly complex; when the United States enters into consent decrees relating to violations similar to those alleged here, they ordinarily have provisions setting forth compliance obligations in considerable detail, and are very technical in nature. Therefore, the United States' views in this matter may be of some assistance to the Court.

The United States has not yet taken a position as to what comments it will provide on the proposed consent judgment in this matter. That issue will require coordination within the EPA, which has the relevant expertise on these questions, as well as with multiple offices of the United States Department of Justice, which has brought numerous enforcement actions relating to storm water and municipal sewer systems. The United States will require the full statutory 45 days to complete this coordination process, particularly in light of the nature of this action. The present filing is directed only to the United States' right to the statutory review period, and not to the ultimate merits of the issues.

The United States supports the amicable resolution of litigation, including citizen suits,

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[1] See Office of Enforcement and Compliance Assurance, Fiscal Year 2006 Accomplishments Report at 10, 16-17 (2007). http://www.epa.gov/compliance/resources/reports/accomplishments/oeca/fy06accomplishment.pdf

whenever possible. At the same time, however, in its review of citizen suit settlements, the United States must ensure that the settlements, *inter alia*, serve the public interest, comply with the law, and adequately address any ongoing environmental harms. These are the same standards that the courts apply in determining whether to approve a proposed consent judgment. See, e.g., Electronic Controls Design, 909 F.2d at 1355 (stating that a Clean Water Act settlement must be consistent with the law); Citizens for a Better Environment, 718 F.2d at 1126 (holding that a consent judgment must be fair and consistent with the public interest).[8]

III. JUDICIAL RESOLUTION OF THIS ISSUE IS APPROPRIATE

This issue is an important one that would benefit from judicial resolution. The United States learned of the anticipated settlement in this matter only by happenstance, when Judge Coffin sought the United States' views on a substantive issue that arose during settlement negotiations. Should future parties mistakenly believe that they can avoid United States review of a settlement through their choice of caption, the United States will not necessarily be on notice of that issue, and will not be in a position to notify the Court that it is entitled to a 45-day review period.

The United States is not aware of any authority directly addressing the issue of whether a

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[8] The Clean Water Act requires that plaintiffs serve a copy of any complaint in a citizen suit on the Attorney General and the Administrator. 33 U.S.C. 1365(c)(3). When the United States receives such a complaint, it sends out a standard letter to the parties with information on its role in citizen suit matters. That standard letter contains a paragraph addressing the interpretation of the phrase "consent judgment," and setting forth the United States' long-standing view that a settlement agreement is within this statutory phrase. The United States has no record of receiving a copy of the complaint in this matter, and thus did not send the parties to this case its standard letter. The United States has inquired as to whether plaintiffs have a record of serving a copy of the complaint pursuant to this provision. Had the United States received a copy of the complaint, it would have put the parties further on notice of its position on this issue.

document captioned a "settlement agreement" is subject to 33 U.S.C. § 1365.[9] As set forth above, the United States believes that the answer to this question is readily ascertainable. However, judicial resolution may be beneficial to further clarify the obligation of the parties to citizen suits to provide proposed consent judgments to the Administrator and the Attorney General.

CONCLUSION

For the reasons set forth above, the United States requests that the Court defer issuing any ruling in this matter until August 3, 2007. The United States will provide any comments on the proposed consent judgment by that date.

Dated:

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[9] Plaintiffs suggest that the lack of authority on point indicates that the United States' position is incorrect. On the contrary, parties in other cases routinely submit documents to the United States for review notwithstanding that they are formatted as "settlement agreements" or in some other fashion. See, e.g., Deltakeeper Chapter of Baykeeper v. Brasil & Sons Dairy, Inc., No. CV-06-01464 OWW (DLB) (E.D. Cal.) (proposed "Stipulated Dismissal and Settlement Agreement" submitted to the United States for 45-day review period); No Spray Coal. v. City of New York, No. 1:00-cv-05395-GBD (S.D.N.Y.) (proposed "Stipulation of Agreement and Order" submitted to the United States for 45-day review period).

Where the United States has learned of a settlement agreement under the Clean Air Act or Clean Water Act in the past, it has raised the issue of the 45-day review period with the parties and secured an opportunity for review. The United States made a similar effort here, but it was unfortunately necessary to draw this matter to the attention of the Court.

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ATTACHMENT B

Chapter 5

Environmental Impacts of CSOs and SSOs

This chapter describes the extent to which CSOs and SSOs cause or contribute to environmental impacts. The chapter first discusses EPA's framework for evaluating environmental impacts from CSOs and SSOs, using water quality standards. The chapter then summarizes environmental impacts from CSOs and SSOs as reported in national assessments and presents the results of new analyses completed by EPA. Next, site-specific examples are presented to illustrate the types of impacts that CSOs and SSOs have at the local watershed level. Lastly, the factors that affect the extent of environmental impacts caused by CSO and SSO discharges are described.

In conducting data collection and research for this report, EPA found that CSOs and SSOs cause or contribute to environmental impacts that affect water quality and the attainment of designated uses. Pollutant concentrations in CSOs and SSOs alone may be sufficient to cause a violation of water quality standards. Impacts from CSOs and SSOs are often compounded by impacts from other sources of pollution such as storm water runoff, decentralized wastewater treatment systems, and agricultural practices. This can make it difficult to identify and assign specific cause-and-effect relationships between CSO or SSO events and observed water quality impacts and impairments.

For the purpose of this report, environmental impacts do not include human health impacts. The extent of human health impacts due to CSOs and SSOs is discussed in Chapter 6.

5.1 What is EPA's Framework for Evaluating Environmental Impacts?

EPA's water quality standards program provides a framework for states and authorized tribes to assess and enhance the quality of the nation's waters. Water quality standards define goals by designating uses for the water (e.g., swimming, boating, fishing) and setting pollutant

In this chapter:

limits (criteria) necessary to protect the uses.

Attainment of water quality standards is determined through a process of evaluation and assessment, as follows:

- States adopt water quality goals or standards that, once approved by EPA, serve as the foundation of the water quality-based control program mandated by the Clean Water Act.
- States, EPA, and other federal agencies (e.g., U.S. Geological Survey) conduct water quality monitoring studies to measure water quality and assess changes over time.
- States compare measured water quality to goals or standards in a statewide assessment required under section 305(b) of the Clean Water Act and report conditions as good, threatened, or impaired.
- Waters designated as impaired are included on a state's 303(d) list. A total maximum daily load (TMDL) is required for each pollutant causing impairment. The TMDL establishes an allowable pollutant load that, when achieved, will result in the attainment of the water quality standard.

The discussion of environmental impacts in this chapter is focused on circumstances in which a designated use is not being attained due entirely or in part to CSO and SSO discharges. The pollutants found in CSOs and SSOs can potentially impact five designated uses:

- Aquatic life support, meaning the water provides suitable habitat for the protection and propagation of desirable fish, shellfish, and other aquatic organisms.
- Drinking water supply, meaning the water can supply safe drinking water with conventional treatment.
- Fish consumption, meaning the water supports fish free from contamination that could pose a significant human health risk.
- Shellfish harvesting, meaning the water supports a population of shellfish free from toxics and pathogens that could pose a significant health risk to consumers.
- Recreation, meaning water-based activities (e.g., swimming, boating) can be performed without risk of adverse human health effects.

As discussed in Section 4.1 of this report, the principal pollutants present in CSOs and SSOs are: microbial pathogens, oxygen depleting substances, TSS, toxics, nutrients, and floatables. Table 5.1 summarizes designated uses likely to be impaired by each of these pollutants.

Pollutants of Concern in CSOs and SSOs Likely to Cause or Contribute to Impairment	Aquatic life support	Drinking water supply	Fish consumption	Shellfish harvesting	Recreation
Oxygen-demanding substances	●				
Sediment (TSS)	●				
Pathogens		●	●	●	●
Toxics	●		●	●	
Nutrients	●	●			
Floatables					●

Table 5.1

Pollutants of Concern in CSOs and SSOs Likely to Cause or Contribute to Impairment

The pathogens present in CSO and SSO discharges have the potential to impact several designated uses, including drinking water supply, fish consumption, shellfish harvesting, and recreation.

5.2 What Overall Water Quality Impacts Have Been Attributed to CSO and SSO Discharges in National Assessments?

States are required to periodically assess the health of their waters and the extent to which water quality standards are being met. EPA compiles these reports into the NWQI, which offers a comprehensive review of water quality conditions nationwide. This section summarizes findings from the NWQI and describes two original analyses undertaken by EPA to identify potential water quality impacts from CSO and SSO discharges at the national level.

5.2.1 NWQI 2000 Report

Since 1975, EPA has prepared a series of biennial NWQI reports as required under Section 305(b) of the Clean Water Act. The *NWQI 2000 Report*, the most recently published report, is a compilation of assessment reports on the quality of state waters (EPA 2002c). The NWQI Report categorizes assessed waters as follows:

Good – fully supporting all uses or fully supporting all uses but threatened for one or more uses; or

Impaired – partially or not supporting one or more uses.

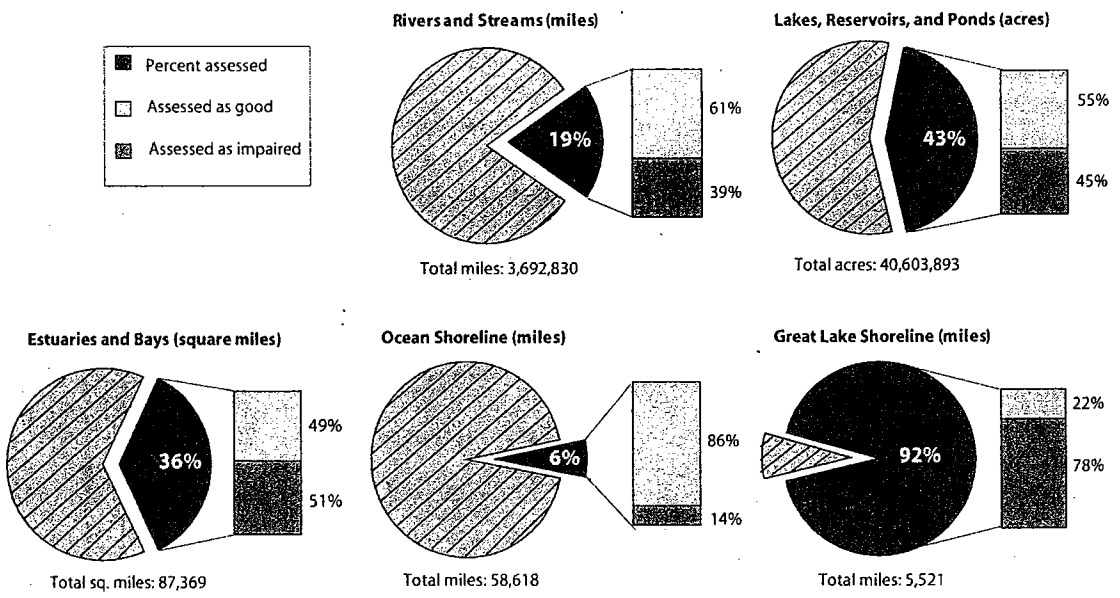
The national summary of the quality of assessed waters, by type, is presented in Figure 5.1. This summary shows that 19 percent of the nation's total river and stream miles; 43 percent of lake, reservoir, and pond acres; 36 percent of estuarine and bay square miles; 6 percent of ocean shoreline miles; and 92 percent of Great Lakes shoreline miles were assessed.

EPA's *NWQI 2000 Report* also identified the types of pollutants or stressors most often found to impair the assessed waters as well as the leading sources of these pollutants. These results are presented in Table 5.2 and Table 5.3, respectively. Overall, EPA found that the three pollutants most often associated with impaired waters were solids, pathogens, and nutrients. All three are present in CSO and SSO discharges. Therefore, at a minimum, CSOs and SSOs contribute

Figure 5.1

NWQI 2000 Report: Summary of Assessed Waters by Waterbody Type (EPA 2002c)

Waterbody assessments are normally based on five broad types of monitoring data: biological integrity, chemical, physical, habitat, and toxicity. Monitoring data are then integrated for an overall assessment.



Pollutant/Stressor	Rivers and Streams	Lakes, Ponds, and Reservoirs	Estuaries and Bays	Ocean Shoreline	Great Lakes Shoreline
Habitat alterations	3				
Metals		2	1		
Nutrients	5	1			2
Oil and grease				5	
Oxygen-depleting substances	4	5	3	2	5
Pathogens (bacteria)	1		4	1	3
Pesticides			2		
Priority toxic organic chemicals			5		1
Siltation (sedimentation)	2	3			4
Suspended solids				4	
Total dissolved solids		4			
Turbidity				3	

Table 5.2

Pollutants and Stressors Most Often Associated with Impairment (EPA 2002c)

Overall, EPA found that the three pollutants most often associated with impaired waters were solids (i.e., suspended solids, siltation, and total dissolved solids), pathogens, and nutrients. This table ranks the top five pollutants (or stressors) for each waterbody.

Pollutant Source	Rivers and Streams	Lakes, Ponds, and Reservoirs	Estuaries and Bays	Ocean Shoreline	Great Lakes Shoreline
Agriculture	1	1	5		3
Atmospheric deposition		5	4		4
Contaminated sediment					1
Forestry	5				
Habitat modifications	3				5
Hydrologic modifications	2	2			
Industrial discharges			3		
Land disposal				3	
Municipal point sources			1	5	
Nonpoint sources		4		2	
Septic tanks				4	
Urban runoff/storm sewers	4	3	2	1	2

Table 5.3

Leading Sources of Pollutants and Stressors Causing Water Quality Impairment (EPA 2002b)

Overall, EPA found that pollution from urban and agricultural land, transported by precipitation and runoff, is a leading source of impairment. This table ranks the top five pollutant sources causing water quality impairments.

to the loading of these pollutants where they occur.

The *NWQI 2000 Report* did not cite CSOs or SSOs as a leading source of impairment in any of the five waterbody types listed in Table 5.3 (EPA 2002c). CSOs were identified as a source of impairment for 1,466 square miles (5 percent) of assessed estuaries and 56 miles (1 percent) of Great Lakes shoreline.

The *NWQI 2000 Report* is based on a compilation of individual state assessments, and reporting of the source of impairment varies widely from state to state. The lack of uniformity in assessment and reporting makes it difficult to fully assess the magnitude of CSO and SSO impacts. Inconsistencies in state reporting of CSOs and SSOs as pollutant sources are described below.

Unknown sources and failure to classify: Some states cite unknown pollutant sources or do not attribute impairment to a specific source.

Inconsistent source listing: CSOs are tracked as a specific pollutant source in many, but not all, states where they occur. Twenty of the 32 CSO states identified "combined sewer overflow" as a source of impairment, in the NWQI at least once. Where SSOs are identified by states, they are tracked in an inconsistent manner. States use categories such as "collection system failure (SSO)," "wet weather discharges," and "spills" for tracking SSOs.

Cumulative impacts from multiple pollutant sources: Impacts from CSOs and SSOs are often compounded by impacts from other sources of pollution, particularly during wet weather. As such, CSOs and SSOs may be grouped into municipal or urban source categories.

EPA is working with the states to develop a framework to promote consistent listing of sources of impairment (EPA 2002d).

5.2.2 Analysis of CSO Outfalls Discharging to Assessed or Impaired Waters

As described in Section 4.5, a key EPA initiative undertaken as part of this report was to update, verify, and digitally georeference the inventory of CSO outfall locations documented as part of EPA's 2001 *Report to Congress-Implementation and Enforcement of the CSO Control Policy*. Through this effort, EPA established latitude and longitude coordinates for over 90 percent of CSO outfalls. EPA then linked CSO outfall locations to other national-level data and assessments. For example, permitted CSO outfall locations were linked to 305(b)-assessed waters and 303(d)-impaired waters. These analyses are presented in the following subsections. A similar analysis linking permitted CSO outfall locations with classified shellfish growing areas is presented in Section 5.3.2. An analysis of CSO outfall proximity to drinking water intakes is presented in Chapter 6. More information on each of these analyses is provided in Appendix F.

As discussed in Chapter 4, SSOs do not necessarily occur at fixed locations. Therefore, a parallel effort to georeference SSO locations and evaluate their location with respect

to other national-level data and assessments was not possible.

Analysis of CSO Outfalls Discharging to EPA's 305(b) Assessed Waters

EPA was able to compare CSO outfall locations with assessed waters in the *NWQI 2000 Report* through the 305(b) assessment database for 19 CSO states with electronic 305(b) data. The purpose of this analysis was to determine the number of CSO outfalls discharging to waters classified as good or impaired. EPA limited the analysis to assessed water segments located within one mile downstream of a CSO outfall. The results of this analysis are summarized in Table 5.4. EPA found that of the 59,335 assessed water segments in CSO states with electronic 305(b) data only a small number (733 segments) were in close proximity to CSO outfalls. Of these, 75 percent (552 segments) were impaired. The proximity of a permitted CSO outfall to an impaired segment does not in and of itself demonstrate that the CSO is the cause of the impairment. CSOs generally are located in urban areas where waterbodies also receive relatively high volumes of storm water runoff and other pollutant loads. Nevertheless, the high percentage of impairment associated with CSO outfalls suggests some correlation between impairment and CSOs.

Analysis of CSO Outfalls Discharging to EPA's 303(d) Waters

EPA also compared CSO outfall locations to water segments identified in EPA's Section 303(d) list of impaired waters in states with NHD-index data. For the purpose of this analysis, EPA assumed the causes of reported Section 303(d) impairment most likely attributed to or associated with CSOs were:

- Pathogens
- Organic enrichment, leading to low dissolved oxygen
- Sediment and siltation

Again, EPA limited the analysis to water segments located within one mile downstream of a CSO outfall. The results of this analysis are summarized in Table 5.5. EPA found that although less than one-tenth of one percent (1,560 of more than 1,495,000) of all waterbody segments in CSO states are within one mile of a CSO outfall, between five and 10 percent of the waters assessed as impaired are within that one mile. EPA believes the strong correlation between CSO location and impaired waters is due in part to the

Table 5.4

Occurrence of 305(b) Assessed Waters Within One Mile Downstream of a CSO Outfall

EPA was able to complete this analysis only for states with electronic 305(b) data; that is, for 19 of the 32 states with active CSO permits.

Assessed Waters	Total Assessed	Assessed as Good	Assessed as Impaired	Percent Impaired
Assessed 305(b) segments in CSO states with electronic 305(b) data	59,335	44,457	14,878	25%
Assessed segments within one mile downstream of a CSO outfall	733	181	552	75%

Table 5.5

Occurrence of 303(d) Listed Waters Within One Mile Downstream of a CSO Outfall

Waters within one mile of a CSO outfall are much more likely to be assessed as impaired than a typical water in a CSO state.

Listed Waters	Reason or Cause of Listing		
	Pathogens	Enrichment Leading to Low Dissolved Oxygen	Sediment and Siltation
Total number of listed waters in CSO states	3,446	1,892	3,136
Number of listed waters within one mile of a CSO outfall	191	163	149

following factors: CSOs generally are located in urban areas where waterbodies also receive relatively high volumes of storm water runoff and other pollutant loads; and waters within urban areas are much are more likely to be assessed as part of the 305(b) process.

As described in the 305(b) analysis, the existence of a permitted CSO outfall in close proximity to an impaired water does not in and of itself demonstrate that the CSO is the cause of the impairment. It does suggest, however, that CSOs should be considered as a potential source of pollution with respect to TMDL development. EPA has collected anecdotal data demonstrating that CSOs are being considered in TMDL development and that substantial load reductions have been assigned to CSOs in some communities as a result of the TMDL process.

5.2.3 Modeled Assessment of SSO Impacts on Receiving Water Quality

The unpredictable nature of most SSO events makes it difficult to monitor and collect the data needed to measure the occurrence and severity of environmental impacts. As described in Section 4.7 of this report, however, EPA was able to compile a substantial amount of information on the frequency, volume, and cause of SSO events. From these data, EPA found 72 percent of these SSO events reach a surface water.

Using the national SSO data, EPA developed a simple model for estimating the likely impact of SSO events on different size receiving waterbodies, based on reasonable assumptions about SSO event duration and concentrations of fecal coliform bacteria in SSO discharges. For the purpose of this report, modeled impacts associated with SSO events are evaluated in terms of violations of the single sample maximum water quality criterion for fecal coliform. That is, a predicted concentration of greater than 400 counts of fecal coliform per 100 mL of surface water would be considered to be a water quality standards violation.

The model was run under three different scenarios: one that assumed the entire volume of each modeled SSO discharge reached a surface water (100% delivery), a second that assumed half the volume of each modeled SSO discharge reached a surface water (50% delivery), and a third that assumed ten percent of the volume of each modeled SSO discharge reached a surface water (10% delivery).

Example: Change in Flow in Washington, D.C. Area Waterbodies as a Result of Wet Weather

Flow in a particular waterbody can increase dramatically with a wet weather event. For example, after an extended period without rain, 2.6 inches of rain fell in the Washington, DC area over two days in late February, 2004. This, in turn, caused flow in local waterbodies to increase by varying amounts–e.g., to 63 times the median flow in the Anacostia River. The flows given reflect the peak daily flow observed due to this rainfall event.

Waterbody	Median Flow (cfs)	February Storm Peak (cfs)	Peak Factor
Potomac River	8,490	79,300	9
Monocacy River	624	9,130	15
Goose Creek	250	4,480	18
Seneca Creek	91	1,630	18
Anacostia River	47	2,950	63

Flow varies widely in receiving waters both from year to year and seasonally. Flow can also increase substantially in a particular receiving water during local wet weather events. The potential impact of a specific SSO discharge depends on a number of factors including flow and background pollutant concentrations in the receiving water at the time the discharge occurs, and the volume and strength of the discharge that reaches the receiving water.

The results of EPA's simple model of SSO-related water quality impacts are presented in Table 5.6 for a range of flow conditions, wastewater strength, and delivery ratios. In general, SSOs consisting of concentrated wastewater are predicted to violate water quality standards the majority of the time, particularly under low flow conditions. In contrast, SSOs consisting of more dilute wastewater are much less likely to cause water quality standards violations, particularly under high flow conditions.

Table 5.6

Estimated Percentage of Time SSOs Would Cause Water Quality Standard Violations

EPA developed a frequency distribution characterizing typical volumes of SSO events based on available data in order to estimate the likely impact of SSO events on water quality.

Flow Rate (cfs)	Dilute Wastewater (FC = 500,000 #/ml)			Medium Strength Wastewater (FC = 10,000,000 #/100 ml)			Concentrated Wastewater (FC = 1,000,000,000 #/ml)		
	10% Delivery	50% Delivery	100% Delivery	10% Delivery	50% Delivery	100% Delivery	10% Delivery	50% Delivery	100% Delivery
50	12%	27%	36%	45%	68%	77%	95%	99%	100%
100	9%	20%	27%	36%	58%	68%	92%	98%	99%
250	5%	12%	18%	25%	45%	55%	84%	95%	97%
500	3%	9%	12%	18%	36%	45%	77%	92%	95%
1000	2%	6%	9%	13%	27%	36%	68%	86%	92%
5000	1%	2%	3%	5%	13%	18%	45%	68%	77%
10000	0%	1%	2%	3%	9%	13%	36%	58%	68%

A detailed description of the methodology used to develop these estimates is presented in Appendix H. No comparable analysis of SSO discharges to lake or estuarine waters was undertaken.

5.3 What Impacts on Specific Designated Uses Have Been Attributed to CSO and SSO Discharges in National Assessments?

EPA, other federal agencies, and non-governmental organizations periodically conduct national assessments of environmental impacts that are framed in terms of the loss of a specific designated use. Examples include beach closures in waters designated for recreation and shellfish harvesting restrictions in waters designated for shellfishing. This section summarizes findings from a number of national assessments, with emphasis placed on environmental impacts identified as being caused, or contributed to, by CSOs or SSOs.

EPA was unable to identify national assessments that specifically consider the impacts of CSOs and SSOs on aquatic life, although EPA found several state and local watershed assessments which do so. These assessments are discussed in Section 5.5 of this report. Also, for purposes of this report, impairment of drinking water supply as a designated use is considered to be a human health rather than an environmental impact. Consequently, drinking water supply is discussed in Chapter 6 of this report.

5.3.1 Recreation

Recreation is an important designated use for most waters of the United States. The results of national assessments of recreational waters and the causes of impairment are described in the following subsections.

EPA BEACH Program

EPA's Beaches Environmental Assessment and Coastal Health Program (BEACH Program) conducts an annual survey of the nation's swimming beaches, the National Health Protection Survey of Beaches. Nearly 2,500 agencies representing beaches in coastal locations, the Great Lakes, and inland waterways participate in the survey. With respect to designated use impairment during the 2002 swimming season, 25 percent of the beaches inventoried (709 of 2,823) had at least one advisory or closing (EPA 2003a). Elevated bacteria levels accounted for 75 percent of recreational use impairments, manifested as beach advisories and closings. As shown in Figure 5.2, a wide variety of pollutant sources were reported as causing beach advisories and closings. Nearly half of the advisories and closings, however, were reported as having an unknown cause. CSOs were reported to be responsible for 1 percent of reported advisories and closings, and 2 percent of advisories and closings that had a known cause. SSOs (including sewer line blockages and breaks) were reported to be responsible for 6 percent of reported advisories and closings, and 12 percent of advisories and closings that had a known cause.

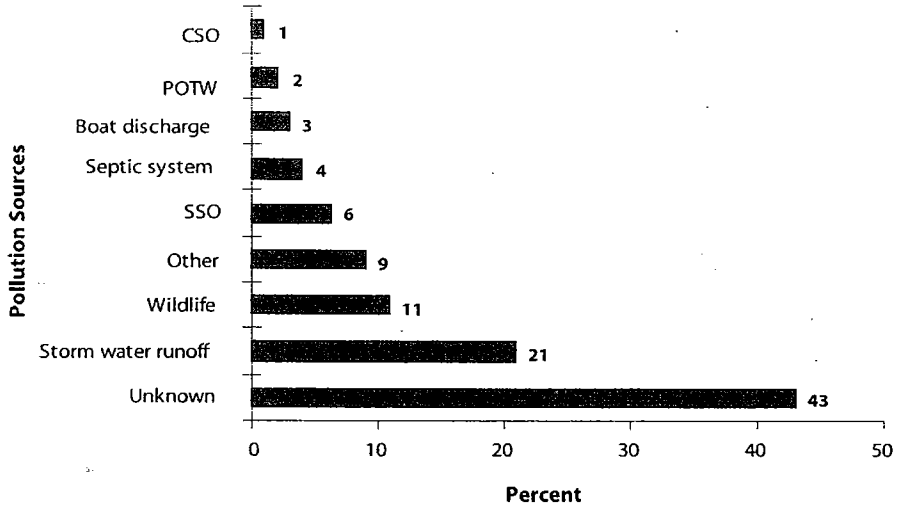


Figure 5.2

Sources of Pollution that Resulted in Beach Advisories and Closings (EPA 2003a)

EPA's BEACH Program conducts an annual survey of the nation's swimming beaches. During the 2002 swimming season, CSOs and SSOs were responsible for 1 and 6 percent, respectively, of reported advisories and closings.

Floatables

Floatables are visible buoyant or semi-buoyant solids that originate from a variety of sources, including CSOs and SSOs. CSOs can be a source of floatables when debris in raw sewage and storm water is released into the receiving waterbody. The type of floatables typically found in CSOs include sewage-related items (e.g., condoms and tampons), street litter, medical items (e.g., syringes), and other material from storm drains, ditches, or runoff (EPA 2002c).

Floatables on beaches and waterways, also known as marine debris, create aesthetic impacts and safety issues that detract from the recreational value of beaches and other public shorelines. As defined by the EPA, marine debris includes all objects found in the marine environment that do not naturally occur there. The marine environment includes the ocean, salt marshes, estuaries, and beaches.

The National Marine Debris Monitoring Program (NMDMP), coordinated by the Ocean Conservancy (formerly the Center for Marine Conservation) and funded by EPA, maintains a national marine debris database. The NMDMP has conducted monthly beach cleanups since 1996. Volunteers track information on specific marine debris items that are added to the national database. The most frequently collected marine debris items from 1996 to 2002 are presented in Table 5.7 (Ocean Conservancy 2003).

Medical and personal hygiene items are an important component of marine debris. Given the nature and use of these items and their disposal in toilets, CSOs and SSOs are considered a possible source. The Ocean Conservancy's 2003 International Coastal Cleanup, a large one-day event, found a substantial amount of medical and personal hygiene items on U.S. beaches (Ocean Conservancy 2004). More than 7,500 condoms and 10,000 tampons and tampon applicators were collected from 9,200 miles of U.S. shoreline during this event. While this

Table 5.7

NMDMP Marine Debris Survey Results from 1996 - 2002 (Ocean Conservancy 2003)

Funded by EPA's Office of Water, the NMDMP uses standardized data collection methods to determine the status of and trends in marine debris pollution. The data are compiled in a national database.

Marine Debris (excluding ocean-based)	Total Items
Straws	83,714
Plastic beverage bottles	60,426
Other plastic bottles	36,598
Balloons	34,355
Plastic food bottles	18,383
Plastic bottles	11,946
Condoms	1,675
Syringes	1,379
Plastic bags with seam <1 meter	422
Cotton swabs	171
Metal beverage cans	109
Plastic bags with seam > 1 meter	88
Tampon applicators	61
Motor oil containers	19
Six-pack rings	17

information is inconclusive on its own, it does suggest that CSOs and SSOs may contribute to the occurrence of medical and personal hygiene waste found on beaches and other shorelines.

5.3.2 Shellfish Harvesting

Commercial and recreational shellfishing in populated coastal areas has declined steadily since the early 1900s, when outbreaks of typhoid were linked to untreated wastewater. Environmental impacts that restrict shellfish harvesting as a designated use are discussed in the following section. Human health impacts related to the consumption of contaminated fish and shellfish are discussed in Chapter 6.

NOAA National Shellfish Register

NOAA published assessments of classified shellfish growing waters in the contiguous states every five years between 1966 and 1995. The last report, *1995 National Shellfish Register of Classified Growing Waters*, provided an assessment of 4,230 different classified shellfish growing areas in 21 coastal states (NOAA 1997). Areas open for harvesting are rated as "approved" or "conditionally approved;" areas where harvesting is limited are rated as "restricted" or "conditionally restricted;" and areas where harvesting is not allowed are rated as "prohibited."

Findings from the 1995 report with respect to shellfish harvesting are as follows:

- 76 percent of all classified waters were approved or conditionally approved for harvest (14.8 million acres);

- 11 percent of all classified waters were restricted or conditionally restricted (3.9 million acres); and
- 13 percent of all classified waters were prohibited (2.8 million acres).

NOAA reported that the primary basis for harvest restrictions was the concentration of fecal coliform bacteria associated with untreated wastewater and wastes from livestock and wildlife. CSOs are one of many sources of fecal coliform that impact shellfish harvesting. A summary of all pollution sources identified in the 1990 and 1995 National Shellfish Registers as causing or contributing to restrictions and prohibitions is presented in Table 5.8.

A cooperative effort between the Interstate Shellfish Sanitation Conference and NOAA has resulted in the development of a state Shellfish Information Management System. The system will summarize basic information about shellfish programs

CSO controls implemented in Oswego, NY, have helped provide suitable habitat for desirable fish.

Photo: P. MacNeill

Table 5.8

Pollution Sources Reported for Harvest Limitations on Classified Shellfish Growing Waters in the 1990 and 1995 National Shellfish Registers (NOAA 1997)

Compared to the 1990 Register, the 1995 Register shows significant decreases in the acreage that is harvest-limited due to contributions from industry and wastewater treatment plants; the acreage impacted by CSOs remained relatively constant during the five-year period.

Pollution Source	1990[a]	1995[a]
Urban Runoff Precipitation-related discharges (e.g., septic leachate, animal wastes) from impervious surfaces, lawns, and other urban land uses	38%	40%
Upstream Sources Contaminants from unspecified sources upstream of shellfish growing waters	46%	39%
Wildlife Precipitation-related runoff of animal wastes from high wildlife concentration areas (e.g., waterfowl)	25%	38%
Decentralized Wastewater Treatment Systems Discharge of partially treated sewage from malfunctioning on-site septic systems	37%	32%
Wastewater Treatment Plants Routine and accidental sewage discharge from public and private wastewater treatment plants with varying levels of treatment	37%	24%
Agricultural Runoff Precipitation- and irrigation-related runoff of animal wastes and pesticides from crop and pasture lands	11%	17%
Marinas Periodic discharge of untreated or partially treated sewage from berthed vessels	–	17%
Boating Periodic discharge of untreated or partially treated sewage from vessels underway or anchored offshore	18%	13%
Industry Routine and accidental discharges from production/manufacturing processes and on-site sewage treatment	17%	9%
CSOs Discharge of untreated sewage/storm water when sewage system capacity is exceeded by heavy rainfall	7%	7%
Total harvest-limited area, in acres	**6.4 million**	**6.7 million**

[a] Harvest-limited areas are impacted by multiple pollution sources. Annual values do not total 100 percent.

in each state, replacing NOAA's national shellfish register. This system, which will provide spatial data through a web-based interface, is expected to be operational in 2004.

Analysis of CSO Outfalls Discharging Near Classified Shellfish Growing Areas

EPA associated the location of individual CSO outfalls with classified shellfish growing areas as reported by NOAA in 1995, the last year for which national data were available. EPA limited the analysis to classified shellfish growing areas within five miles of a CSO outfall. The number of classified areas was tabulated by shellfish harvest classification. As shown in Table 5.9, harvesting was prohibited or restricted in most of the classified shellfish growing areas that are proximate to CSO outfalls. As discussed earlier under similar 305(b) and 303(d) analyses, the presence of a CSO outfall alone does not necessarily mean that the CSO is causing or contributing to the prohibition or restriction. Many classified shellfish growing areas where shellfish harvesting is currently prohibited or restricted are in urban areas in the Northeast where CSOs are one of several factors that might account for impairment. Nevertheless, the association between prohibited and restricted conditions and the presence of CSO outfalls is strong.

Table 5.9

Harvest Limitations on Classified Shellfish Growing Areas Within Five Miles of a CSO Outfall

Fifty-eight active CSO permits in nine states cover outfalls located within five miles of a classified shellfish growing area. Shellfish harvesting is prohibited or restricted in the majority of the 659 shellfish growing areas in proximity to CSO outfalls in national database.

Shellfish Harvest Classification	Number of Classified Shellfish Growing Areas within 5 Miles of a CSO outfall
Prohibited	411
Restricted	80
Approved	154
Unclassified	14
Total	**659**

5.4 What Overall Water Quality Impacts Have Been Attributed to CSO and SSO Discharges in State and Local Assessments?

State and local governments track environmental impacts and gather data for programmatic reasons that are not necessarily included in national assessments. Examples of environmental impacts included in this section were gathered from state and local reports and from watershed studies in which broad assessments of water quality were undertaken. These examples are not meant to be comprehensive. They are presented to illustrate environmental impacts attributed to CSO and SSO

discharges, and, in some instances, the site-specific circumstances under which they occurred.

5.4.1 Water Quality Assessment in New Hampshire

In its 2000 *Water Quality Report*, New Hampshire reported that bacteria is the third leading cause of water quality impairment in the state, causing or contributing to 13 percent of the total miles of impaired rivers and streams in the state (NHDES 2000). Elevated levels of bacteria impaired recreational uses as well as shellfish harvesting uses in New Hampshire. The overall sources of water quality impairment to rivers and streams in New Hampshire are presented in Figure 5.3. As shown, unknown sources cause 79 percent of the 642 miles of impairment reported. A total of 24.1 miles were impaired due to CSOs; this represents 3 percent of all impaired waters in the state and 19 percent of impaired waters with a known source of impairment.

5.4.2 Water Quality Assessment of the Mahoning River Near Youngstown, Ohio

Working in cooperation with the City of Youngstown, Ohio, USGS conducted a comprehensive assessment of water quality and habitat in the Mahoning River and its tributaries (USGS 2002). The City of Youngstown has 80 CSOs that discharge to local receiving waters. Water quality monitoring was conducted during 1999 and 2000. CSO discharges were found to contribute to bacterial and nutrient loads observed in the Mahoning River, but they were not the only factor adversely affecting water quality and habitat. USGS found that:

> *"Improvement of water quality in the lower reaches of the Mahoning River and Mill Creek (a tributary) to the point that each waterbody meets its designated-use criteria will likely require an integrated approach that includes not only abatement of sewer overflow loadings but also identification and remediation of other loadings in Youngstown and improvement of water quality entering Youngtown."*

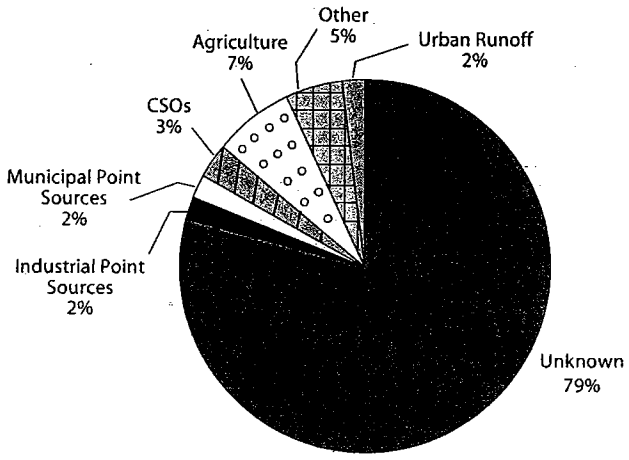


Figure 5.3

Sources of Water Quality Impairment in New Hampshire (NHDES 2000)

In 2000, New Hampshire reported a total of 24.1 miles of rivers and streams impaired by CSOs; this represents 3 percent of all impaired waters in the state and 19 percent of impaired waters with a known source of impairment.

5.4.3 Water Quality in Indianapolis, Indiana

The City of Indianapolis, Indiana, is working to identify and implement CSO controls. The city identified specific water quality problems in waterbodies receiving CSO discharges (City of Indianapolis 2000). The city's assessment of pollutant sources contributing to water quality problems is presented in Table 5.10. As shown, CSO discharges and wet weather bypasses at POTWs are ranked high relative to other sources of pollution.

5.4.4 Water Quality Risk Assessment of CSO Discharges in King County, Washington

King County, Washington, conducted a CSO water quality risk assessment for the Duwamish River and Elliot Bay, an estuary in Seattle (KCDNR 1999). The water quality assessment consisted of three main parts. First, more than 2,000 environmental samples were collected and analyzed to determine pollutant concentrations in the water, sediment, and tissues of aquatic organisms. Six CSO locations within the estuary were included in this sampling. The samples were analyzed for 35 chemical, physical, and biological attributes. Next, a computer model was developed to describe water flow and contaminant transport within the estuary. The model was used to estimate current pollution levels in estuarine water and sediment as well as to predict pollution levels after CSO control. Finally, a risk assessment was conducted to determine the impacts of the various pollutants on aquatic life, wildlife, and people that use the estuary. Key study findings with respect to risk reduction resulting from CSO control are as follows:

- No predicted reduction in risks for water-dwelling organisms;
- Some predicted reduction in risks to sediment-dwelling organisms near the CSO discharges;
- A possible increase in the variety of benthic organisms near CSOs as the result of a decrease in organic matter;
- A possible reduction in impacts of localized scouring and sedimentation, which may be

Table 5.10

Relative Contributions of Pollutant Sources to Water Quality Problems in Indianapolis, Indiana (City of Indianapolis 2000)

Indianapolis ranked the contribution of CSO discharges and wet weather bypasses at POTWs high relative to other sources of pollution in local receiving waters. Blank spaces represent negligible or no contribution in comparison to other sources.

Pollutant Source	Dissolved Oxygen Violations	Bacteria Violations	Aesthetic Problems
CSO Discharges	High	High	High
Upstream Sources		Low	
Storm Water		Low	High
Wet Weather Bypass at POTW	High	High	
Electric Utility Thermal Discharge	Low		
Sediment Oxygen Demand	Low		
Dams	Low		
Water Supply Withdrawals	Low		
Septic Tanks		Low	

small compared to the overall scouring impacts of the river and sediment from other sources; and

- No predicted reduction in risks to wildlife as other sources contribute the majority of the risk-related chemicals.

A stakeholder committee composed of local citizens, business owners, environmental organizations, and tribal governments drew the following conclusions from the study results:

- Existing sediment quality and associated risks to people, wildlife, and aquatic life in the estuary are unacceptable;
- Levels of human pathogens and fecal coliform in the estuary are unacceptable;
- Controlling CSOs according to the King County comprehensive sewer plan will improve some aspects of environmental quality; and
- Even if CSOs are completely eliminated, overall environmental quality of the estuary will continue to be unacceptable.

5.5 What Impacts on Specific Designated Uses Have Been Attributed to CSO and SSO Discharges in State and Local Assessments?

Examples of environmental impacts included in this section were gathered from state and local reports and watershed studies; the examples are presented according to the designated use impacted by CSO and SSO discharges. They are not meant to be comprehensive. They are presented to illustrate representative environmental impacts attributed to CSO and SSO discharges, and, in some instances, the site-specific circumstances under which they occurred. CSO or SSO discharges are clearly the cause of documented environmental impacts in some cases, and are a contributing factor in others. Several examples summarize studies in which impacts from CSOs and SSOs were sought, but were not found.

5.5.1 Aquatic Life Support

The designated use for aquatic life support is achieved when the water provides suitable habitat for the protection and propagation of desirable fish, shellfish, and other aquatic organisms. Oxygen-demanding substances are the principal pollutants found in CSOs and SSOs that can cause or contribute to impaired aquatic life support. CSO and SSO discharges can also contribute sediment, pathogens, nutrients, and toxics to receiving waters, but there is little evidence that levels of these pollutants in CSOs and SSOs are major causes of aquatic life impairment. Select examples of impacts or relevant studies are presented below.

Fish Kills in North Carolina

Reports of impaired aquatic life (i.e., fish kills) have been investigated and documented in North Carolina since 1997 (NCDENR 2003). A summary of fish kills attributed to sewage spills from 1997 to 2002 is presented in Table 5.11. As shown, SSOs are a relatively small cause of the documented fish kills. Other causes of

Table 5.11

Fish Kills Reported in North Carolina: 1997 - 2002 (NCDENR 2003)

Between 1997 and 2002, NCDENR attributed the deaths of nearly 10,000 fish to SSOs (sewer spills).

Year	Total Number of Fish Kills	Number of Fish Kills Attributed to Sewer Spills	Total Number of Fish Killed	Number of Fish Killed in Events Attributed to Sewer Spills
1997	57	8	91,998	8,384
1998	58	3	593,545	336
1999	54	1	1,298,472	200
2000	58	2	716,141	400
2001	77	2	1,369,140	490
2002	45	0	269,635	0

fish kills include chemical spills, heavy rainfall, eutrophication, low dissolved oxygen due to unspecified causes, natural phenomena (e.g., temperature and salinity effects), and unknown causes.

Individual fish kill events linked to sewage spills in North Carolina are presented in Table 5.12. Descriptive comments provided by field crews investigating the fish kills are listed in an abbreviated manner. The oxygen-depleting substances in the spilled sewage appear to reduce oxygen levels to a point at which there is insufficient oxygen to support aquatic life, particularly when spills occur in relatively small streams. No North Carolina communities are served by CSSs.

Assessment of SSO Impacts on Fish and Aquatic Life at Camp Pendleton, California

In September 2000, an SSO occurred at the Marine Corps Base Camp Pendleton near Oceanside, California. The California State Water Resources Control Board investigated the spill, monitored water quality, and assessed the impact of the spill on fish and aquatic life (Vasquez 2003). The SSO occurred at a deteriorated access port in a sewer force main operated by the Marine Corps. An estimated 2.73 million gallons of sewage was spilled over an eight-day period. Data showed that dissolved oxygen levels in the impacted area dropped below 1 mg/L, well below the numeric criteria of 5 mg/L and levels needed to support most aquatic life, and remained low for several days. The assessment of impacted wildlife documented 320 dead fish, 67 dead shrimp, 169 dead clams, 1 dead snail, and 1 dead bird.

Assessment of PCBs in the Buffalo River, New York

Polychlorinated biphenyls (PCBs) are a contaminant of concern for the Buffalo River in New York and the Great Lakes in general. PCB levels in the river often exceed state water quality criteria, and PCBs found in fish tissue exceed levels allowed by the Food and Drug Administration. In 1994, a study was conducted to identify sources of PCBs to the Buffalo River (Loganthan et al. 1997). Monitoring was conducted in the 700-acre Babcock Creek sewershed, one of 27 sewersheds served by combined

Table 5.12

Fish Kills Caused by Sewage Spills in North Carolina: 1997 - 2001 (NCDENR 2003)

Oxygen-depleting substances in SSOs (sewer spills) can reduce in-stream dissolved oxygen to levels that are insufficient to support aquatic life.

Date Investigated	Waterbody	Number of Fish Killed	Comments
7/1797	Tributary to Cokey Swamp	300	Spill of at least 23,000 gallons of sewage
7/14/97	Elerbee Creek	120	Sewer spill at storm drain due to sump overflow
7/29/97	Tributary to Elerbee Creek	100	30,000 gallon spill at pump station
8/13/97	Swift and Mahlers Creeks	1,000	500,000–1,000,000 gallon sewer line spill
8/14/97	Tributary to Northeast Creek	200	20,000 gallon sewer line spill
8/19/97	Coon Creek	3,500	1,200,000 gallon spill at pump station
9/23/97	Little Buffalo Creek	25	50,000 gallon sewage spill
10/7/97	Lovills Creek	3,099	Sewage leakage at junction in sewage lines
11/9/97	East Beaverdam Creek	40	500,000 spill at broken manhole
1/5/98	Cooper's Pond	85	Sewage spill
3/16/98	Unnamed Lake	175	114,000 gallons spilled
7/6/98	Reedy Fork Creek	76	3,000 gallons spilled at pump station
6/29/99	Muddy Creek	200	Sewer overflow reported in area
4/13/00	South Fork Catawba River	200	3,000 gallons spilled
6/9/00	Town Branch	200	5,200 gallons spilled due to blockage
5/3/01	Subdivision Pond	400	Sewage overflow
10/23/01	Tributary to Hare Snipe Creek	90	40,000 gallon sewage spill

sewers in the City of Buffalo. The study detected the presence of PCBs in CSO discharges from the Babcock Creek CSO outfall and confirmed that the city's CSS was a source of PCBs to the river. Monitoring at other study locations as well as watershed modeling indicated that the PCB loadings from unknown, non-CSO sources were more than 10 times greater than the loading from all of the CSOs in the lower Buffalo River (Atkinson et al. 1994).

Whole Effluent Toxicity of CSO Discharges in Toledo, Ohio

Whole effluent toxicity testing uses *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) to measure if a discharge is toxic. The City of Toledo, Ohio, conducted whole effluent toxicity testing on samples collected at four separate CSO outfalls during wet weather conditions (Jones & Henry Engineers 1997). In comparison with laboratory control groups, acute (short-term) toxicity was observed in samples from two CSO

outfalls, and chronic (long-term) toxicity was observed in samples from the other two CSO outfalls. Some chronic toxicity effects were also observed in river samples taken above and below the CSO discharges. Parallel modeling analysis of CSO discharges by the City of Toledo identified copper, lead, silver, and zinc as pollutants of concern.

As a result of the testing, Toledo recently developed a draft *Industrial Wastewater Release Minimization Plan* with policies and procedures for minimizing the discharge of industrial wastewater during CSO events (City of Toledo 2003). The plan includes a variety of measures to reduce the volume and concentration of industrial wastewater discharged to the CSS during wet weather events. Eight industrial facilities identified as having the potential to contribute toxics to CSO discharges have implemented or scheduled changes to their operations to reduce flow, load, or both. The city plans to contact the remaining industrial facilities participating in its Industrial Pretreatment Program to encourage operational modifications to reduce the volume and concentration of wastewater discharged to the CSS during wet weather events.

Analysis of Toxics in CSOs in Washington, D.C.

The District of Columbia Water and Sewer Authority monitored its CSO outfalls for nine months during 1999 and 2000 (DCWASA 2002). The purpose of the monitoring was to characterize the chemical composition of CSO discharges in order to assess the potential for receiving water impacts. Monitoring was carried out for 127 priority pollutants including:

- Total recoverable metals and cyanide
- Dissolved metals
- Pesticides and PCBs
- Volatiles and semivolatiles

The CSO monitoring data reported by the Water and Sewer Authority indicated that all results for priority pollutants were below the laboratory method reporting limits, except for cyanide, chloroform, and several metals. The cyanide and chloroform concentrations were found to be well below the applicable water quality criteria. Further evaluation of detected metals showed that all but dissolved copper and dissolved zinc were at acceptable levels. Additional analysis using the EPA-approved CORMIX and Biotic Ligand models indicated that the effective instream concentrations of dissolved copper and dissolved zinc were also at acceptable levels. Although Washington, D.C. is not a heavily industrialized city, 25 permitted significant industrial users and approximately 3,000 smaller commercial dischargers (e.g., medical facilities, printing and photocopying facilities) discharge to its sewer system.

Fish Diversity in Chicago-area Waterways

Prior to the implementation of wastewater treatment facility upgrades in the 1970s and CSO controls in the 1980s, aquatic life suffered in urban Chicago-area streams. The

ability of Chicago-area waterways to support a rich and diverse aquatic community was severely limited by inadequate levels of wastewater treatment, discharges of chlorinated effluent at treatment facilities, and CSO discharges. In particular, CSO discharges contributed large amounts of oxygen-demanding organic substances that depressed oxygen levels in the waterways, and the presence of chlorine in treatment plant effluent contributed to conditions that were toxic to aquatic life. Improved wastewater treatment, including facilities to dechlorinate treated wastewater, and CSO control over the past 30 years have improved the richness and diversity of aquatic life. As shown in Figure 5.4, the total number of fish species found and supported in the principal waterways in Chicago has expanded during this period (MWRD 1998).

5.5.2 Recreation

Primary contact and secondary contact recreation uses are protected when a waterbody supports swimming and other water-based activities, such as boating, without risk of adverse human health effects from contact with the water. The principal pollutants found in CSOs and SSOs that affect recreational uses at beaches are microbial pathogens and, to a lesser extent, floatables. Select local examples of impacts to recreational uses and relevant studies are presented below. Additional information about potential human health impacts from recreational exposure to water contaminated by CSO or SSO discharges is presented in Chapter 6.

Beach Closures in California

SSOs were identified by the California State Water Resources Control Board as one of several sources of beach pollution in its *California Beach Closure Report 2000* (CSWRCB 2001). Beach closures result from exceedences of bacterial standards. A closure provides the public with notice that the water is unsafe for contact recreation (i.e., swimming poses an unacceptable risk of illness).

The majority of beach closures during 2000 were attributed to unspecified creek and river sources. As shown in

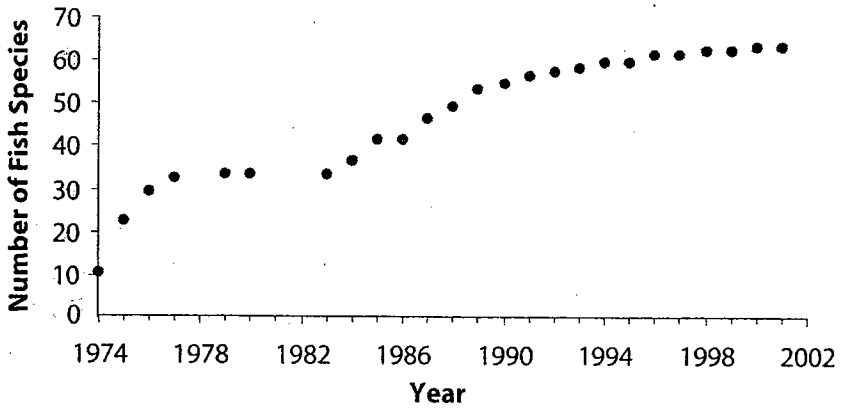


Figure 5.4

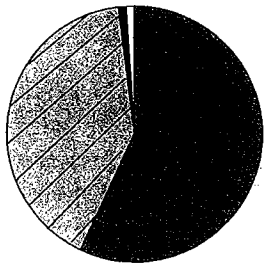
Fish Species Found in the Chicago and Calumet River System, 1974 - 2001 (MWRD 1998; Dennisen 2003)

The total number of fish species found in the Chicago and Calumet River system increased six-fold between 1974 and 2001.

Figure 5.5

Sources of Contamination Resulting in California Beach Closures in 2000 (CSWRCB 2001)

In California, problems with sewer lines such as line breaks, blockages due to grease, roots, or debris; and pump station failures have been identified as the cause of a to a significant number of beach closures.



Sources of Contamination Resulting in Beach Closures	Percent
Unspecified river sources	58%
SSOs	42%
CSOs	<1%
Unknown	<1%
Total	**100%**

Figure 5.5, SSOs accounted for 42 percent and CSOs accounted for less than one percent of all beach closures in California during 2000. California has only two communities with CSSs: San Francisco and Sacramento.

A summary of beach closures due to SSOs in California in 2000 is presented in Figure 5.6. The total number of days that at least one beach was closed is presented in the map by county. The accompanying bar graph shows closures by county in beach-mile days, a measure of beach availability for recreation that integrates miles of beach closed with days of impairment.

Beach Closures in Connecticut

The Connecticut Council on Environmental Quality reported on beach closures in the state in its 2001 Annual Report (CTCEQ 2002). Connecticut's goal is to eliminate beach closures caused by discharges of untreated or poorly treated wastewater, which Connecticut identified as the most common cause of elevated bacteria levels. Currently, several towns close beaches following a heavy rainfall as a precaution, presuming that CSO, SSO, and storm water discharges will occur and contaminate water. The average number of days that beaches are closed depends largely on the frequency and amount of rainfall during the beach season. The long-term trend in beach closures reported by the Council is presented in Figure 5.7.

Beach Closures in Orange County, California

Orange County monitors and reports on bacteria levels along 112 miles of its ocean and bay coastline. Major findings documented in its *Annual Ocean and Bay Water Quality Report* (Orange County 2002) are:

- The total number of SSOs reported to the Orange County Health Care Agency has steadily increased over the past 15 years.
- The total number of ocean and bay beach closures due to SSOs has increased each year since 1999.
- The total number of beach mile-days lost as a result of sewage spills has remained constant since 1999.

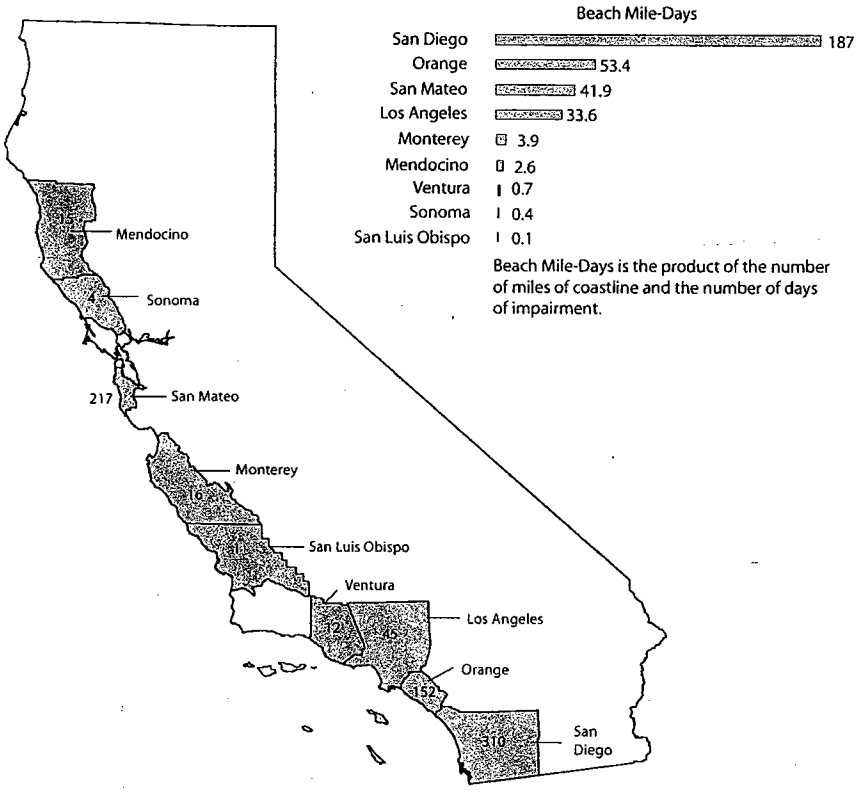


Figure 5.6

Beach Closures in California During 2000 Attributed to SSOs (CASWRCB 2001)

During 2000, nine coastal counties in California reported beach closures as a result of SSOs. Beach closure statistics are presented two ways. The number shown in each county indicates the total number of days that are least one beach in the county was closed in 2000. The number of lost beach mile-days in each county is presented in the adjacent bar chart.

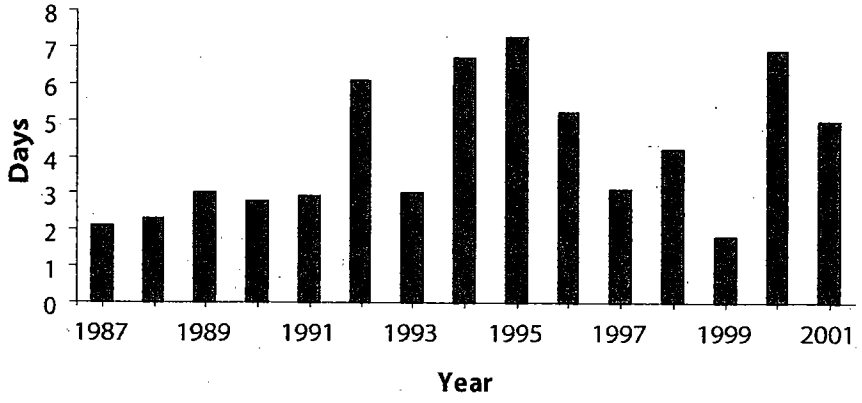


Figure 5.7

Average Number of Days per Year Coastal Municipalities in Connecticut Closed One or More Beaches (CTCEQ 2002)

Yearly variations in beach closures are a product of rainfall patterns and incidents such as sewer line ruptures. In 1999, a relatively dry summer led to less than two closings, on average. The sharp increase in beach closings in 2000 was the result of a rainy summer.

Table 5.13

Summary of Unauthorized Wastewater Discharges in Orange County, California, that Resulted in Beach Closures (Mazur 2003)

Blockages were identified as the cause of approximately three-quarters of all unauthorized wastewater discharges that resulted in beach closures in Orange County between 1999 and 2002.

Cause of Discharge	1999	2000	2001	2002
Line breaks	38	55	69	95
Blockages	210	288	308	409
Pump station failures	14	8	15	11
Treatment plant discharges	0	0	4	2
Miscellaneous	14	25	16	2
Total unauthorized discharges	**276**	**377**	**412**	**522**

A summary of the specific types of unauthorized wastewater discharges that resulted in beach closures is presented in Table 5.13. As shown, the total number of unauthorized discharges resulting in beach closures increased steadily between 1999 and 2002. However, during this same time period the total number of beach mile-days lost as a result of sewage spills has remained constant, suggesting that the impacts from individual spills have been reduced. The Orange County Health Care Agency attributes the reduced impacts to improvements in wastewater utility response procedures and increased regulatory oversight.

Lake Michigan Beach Closures

The Lake Michigan Federation tracks beach closures in Michigan, Indiana, Illinois, and Wisconsin based on data collected from local health departments, parks managers, and other municipal agencies. EPA and NRDC data were used to augment these sources prior to 2000. The Federation's tabulation of beach closures from 1998 to 2002 for all of Lake Michigan is presented in Figure 5.8. The Federation believes that CSOs are associated with a high percentage of the beach closures. Other sources of pathogens that cause or contribute to beach closures include wildlife, storm water runoff, direct human contamination, and re-suspension of bacteria in sediment (Brammeier 2003).

To examine whether CSOs were responsible for beach closures and advisories along Lake Michigan in Cook County, Illinois, the Metropolitan Water Reclamation District of Greater Chicago conducted independent research into river reversals to Lake Michigan (MWRD 2003). River reversals to Lake Michigan occur when, due to heavy rainfall, the gates that separate Lake Michigan and the Chicago River are opened. River water impacted by CSOs is discharged to the lake during river reversals. Swimming at nearby beaches is preemptively banned for two consecutive days by park officials when river reversals occur.

In its report, the District noted hat river reversals (and thus the discharge of CSO-impacted waters) to Lake Michigan were infrequent and did not explain most beach closings and advisories (MWRD 2003). Other sources of bacteria at Chicago beaches include sea gulls and bacteria in sand deposits (USGS 2001).

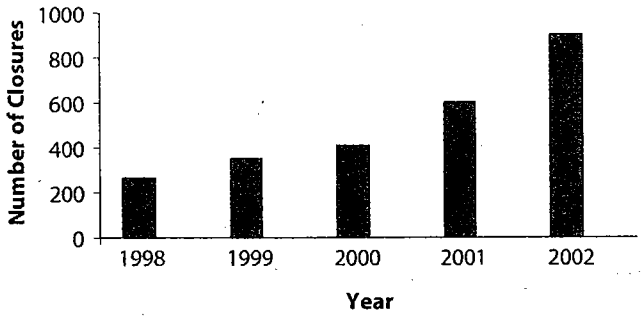


Figure 5.8
Lake Michigan Beach Closures, 1998 - 2002 (Brammeier 2003)

During the 2002 swimming season, authorities issued a total of 919 beach closures and advisories for Lake Michigan. Of the 34 Lake Michigan coastal counties, 65 percent were monitored for beach pollution, up from 50 percent in 2000.

5.5.3 Shellfish Harvesting

The designated use of shellfish harvesting is achieved when a waterbody supports a population of shellfish free from toxics and pathogens that could pose a significant human health risk to consumers. Accordingly, the principal pollutants in CSO and SSO discharges found to impact this use are pathogens, and, to a lesser extent, toxics. An example of shellfishing restrictions imposed as a result of SSO discharges is presented below.

Shellfish Harvest Limitations as a Result of SSO to the Raritan River, New Jersey

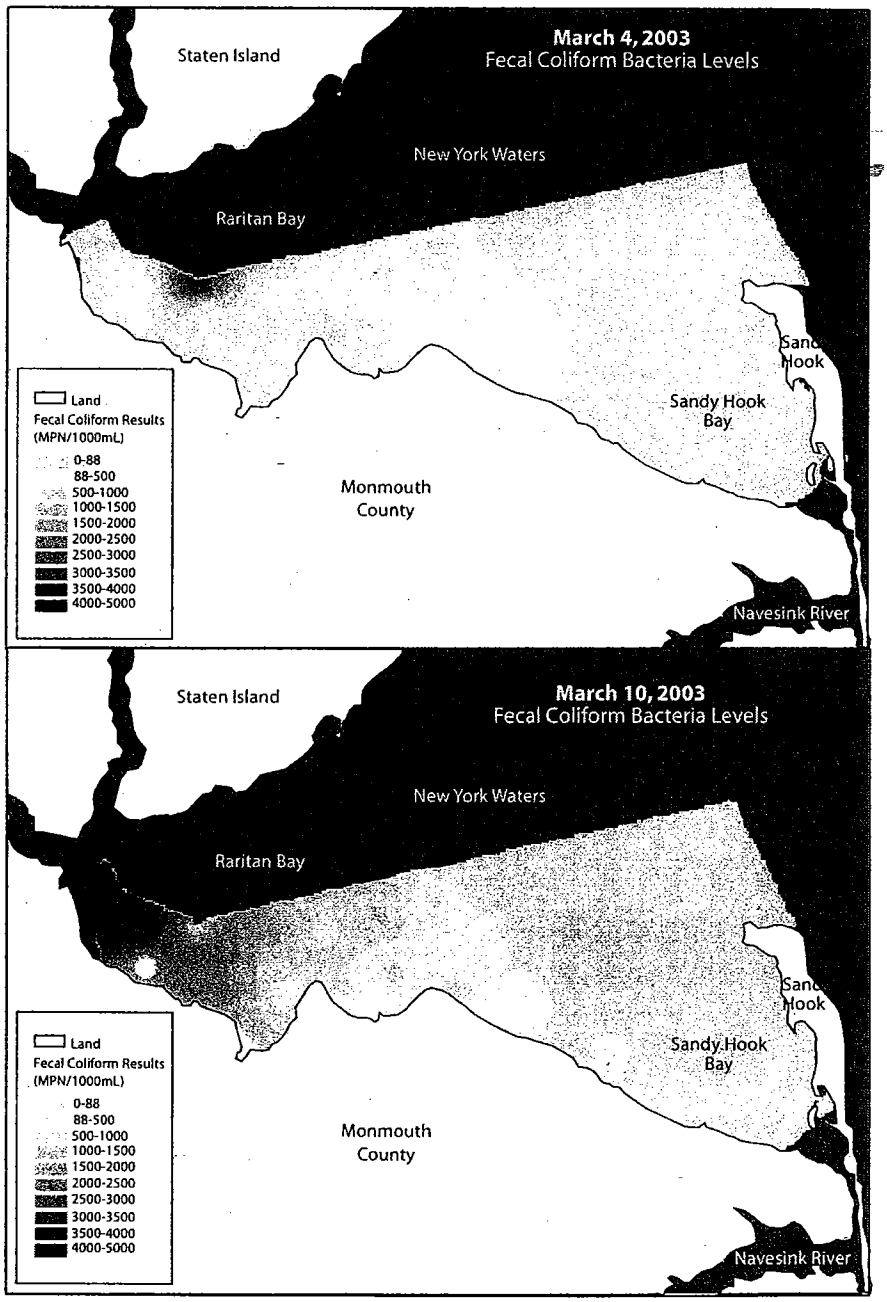
On March 2, 2003, a 102-inch diameter sewer in Middlesex County, New Jersey, ruptured and spilled untreated wastewater into residential areas and the Raritan River. Approximately 570 million gallons of wastewater were discharged over a nine-day period while the pipeline was being repaired. Daily monitoring tracked the movement of elevated bacteria levels in the river (NJDEP 2003). The spill caused high levels of fecal coliform in nearby, downstream waters including Raritan Bay, Sandy Hook Bay, and the Navesink River. EPA and the New Jersey Department of Environmental Protection (NJDEP) sampled affected waters daily and determined that fecal coliform counts were highest in the Raritan Bay (2,400–4,500 fecal coliform counts per 100 mL); counts were also high in Sandy Hook Bay (up to 1,100 fecal coliform counts per 100 mL). Once the spill was stopped, levels of fecal coliform dropped to below 88 counts per 100 mL throughout the river and bay system. By March 15, 2003 (two weeks after the spill began), the highest level reported was in the western end of Raritan Bay at an acceptable level of 43 counts per 100 mL. Fecal coliform was not detected at nearby ocean beaches. The movement of the bacteria plume and its dissipation and dilution over time are illustrated in Figure 5.9.

The spill forced NJDEP to close shellfish beds totaling approximately 30,000 acres in Raritan and Sandy Hook Bays, as well as in the Navesink and Shrewsbury Rivers. Of the total acres closed, more than 6,000 acres were reopened after four weeks, and an additional 20,000 acres were reopened after six weeks (NJDEP 2003).

Figure 5.9

Movement of Bacteria Plume from SSO Discharge in Raritan Bay, New Jersey (NJDEP 2003)

This large SSO event (570 million gallons over nine days, beginning on March 2, 2003) resulted in the closure of more than 30,000 acres of shellfish beds for four to six weeks, until shellfish tissue was clear of fecal coliform, viral, and metal contamination. Data are not shown for the Navesink River and portions of Sandy Hook Bay.



5.6 What Factors Affect the Extent of Environmental Impacts Caused by CSOs and SSOs?

Compiling and presenting information on the extent of environmental impacts caused by CSOs and SSOs is complicated by a number of factors. At the local level, site-specific water quality impacts vary depending on the volume and frequency of CSO or SSO discharges, the size and type of waterbody that receives the overflows, other sources of pollution, and the designated uses for the waterbody. Depending on the particular combination of these factors, impacts from CSOs and SSOs can be visible and intense or relatively minor. Further, because CSO and SSO discharges are intermittent and often occur during wet weather, resulting impacts can be transient and difficult to monitor. This section discusses key factors, including timescale and receiving water characteristics, that affect the extent of environmental impacts caused by CSOs and SSOs.

5.6.1 Timescale Considerations

Although CSO and SSO discharges are intermittent, the resultant impacts may not be temporary and can persist to varying degrees. Some impacts, such as aesthetic impairment due to the presence of floatable material, occur immediately when sewers overflow and are considered short-term impacts. In contrast, nutrients discharged with CSOs and SSOs can contribute to eutrophication on a time scale of weeks or months; such impacts are classified as long-term impacts. Similarly, chronic toxicity impacts associated with metals, pesticides, and synthetic organic compounds that contaminate both waterbodies and sediments can affect aquatic systems over decades.

5.6.2 Receiving Water Characteristics

The degree to which a CSO or SSO discharge produces an environmental impact in a particular waterbody depends on the rate and volume of the discharge, the degree of mixing and dilution, and the assimilative capacity of the waterbody (see Section 5.2.3). In general, the larger the waterbody and the smaller the discharge, the less likely it is that environmental impacts will occur. In contrast, small waters with little dilution and little assimilative capacity can be severely impacted by relatively small discharges.

Once pollutants are discharged into a waterbody, fate and transport processes determine the extent and severity of environmental impacts. Small-scale hydraulics, such as water movement near a discharge point, determine the initial dilution and mixing of the discharge. Large-scale water movement due to river flow and tidal action largely determine the transport of pollutants over time and distance. Processes identified as most important in assessing the impacts of CSOs and SSOs include:

- Dilution and transport of pathogens and toxics in the water column;
- Deposition of settleable solids;
- Resuspension or scour of settleable solids; and
- Chemical exchange or dilution between the water column and sediment pore water (Meyland et al. 1998).

Chapter 6

Human Health Impacts of CSOs and SSOs

In addition to causing and contributing to the environmental impacts reported in Chapter 5, CSOs and SSOs can cause or contribute to human health impacts. Microbial pathogens and toxics can be present in CSOs and SSOs at levels that pose a risk to human health. Human health impacts occur when people become ill due to contact with or ingestion of water or shellfish that have been contaminated with microbial pathogens or toxics.

Although it is clear that CSOs and SSOs contain disease-causing pathogens and other pollutants, EPA found limited quantitative evidence of actual human health impacts attributed to specific CSO and SSO events. Factors such as under-reporting and incomplete tracking of waterborne illness, the presence of pollutants from other sources, and the use of non-pathogenic indicator bacteria in water quality monitoring often make it difficult to establish a cause-and-effect relationship between human illnesses and CSO and SSO discharges.

This chapter documents and expands the current understanding of human health impacts from CSOs and SSOs. The chapter first describes the pollutants commonly present in CSOs and SSOs that can cause human health impacts. The next sections discuss human exposure pathways; demographic groups and populations that face the greatest exposure and risk of illness; and ways in which human health impacts from CSOs and SSOs are communicated, mitigated, or prevented. The identification and tracking of illnesses associated with CSOs and SSOs are also discussed. Several examples of human health impacts are provided in the chapter.

In this chapter:

6.1 What Pollutants in CSOs and SSOs Can Cause Human Health Impacts?

The principal pollutants present in CSOs and SSOs that can cause human health impacts are microbial pathogens and toxics. The presence of biologically active chemicals (e.g., antibiotics, hormones,

and steroids) is also a concern but is less well understood at this time.

6.1.1 Microbial Pathogens

Microbial pathogens include hundreds of different types of bacteria, viruses, and parasites. Microbial pathogens of human and non-human origin are present in domestic and industrial wastewater. The presence of specific microbial pathogens in wastewater depends on what is endemic or epidemic in the local community and is often transient. Some microbial pathogens also have environmental sources. In general, microbial pathogens are easily transported by water. They can cause disease in aquatic biota and illness or even death in humans. The three major categories of microbial pathogens present in CSOs and SSOs are bacteria, viruses, and parasites. Fungi do not have a major presence in wastewater (WERF 2003b), and thus in CSOs and SSOs.

Bacteria

Bacteria are microscopic, unicelluar organisms. Two broad categories of bacteria are associated with wastewater: indicator bacteria and pathogenic bacteria. Indicator bacteria are common in human waste and are relatively easy to detect in water, but they are not necessarily harmful themselves. Their presence is used to indicate the likely presence of disease-causing, fecal-borne microbial pathogens that are more difficult to detect. Enteric (intestinal) bacteria have been used for more than 100 years as indicators of the presence of human feces in water and overall microbial water quality (NAS 1993). Enteric bacteria commonly used as indicators include total coliform, fecal coliform, *E. coli*, and enterococci. Further discussion of bacterial indicators is provided in Section 6.6.

Pathogenic bacteria are also common in human waste and are capable of causing disease. Human health impacts from pathogenic bacteria most often involve gastrointestinal illnesses. The predominant symptoms of pathogenic bacterial infections include abdominal cramps, diarrhea, fever, and vomiting. Pathogenic bacteria can also cause diseases such as typhoid fever, although this is not common in the United States. In addition to attacking the human digestive tract, the pathogenic bacteria present in CSOs and SSOs can cause illnesses such as pneumonia, bronchitis, and swimmer's ear. Common pathogenic bacteria, typical concentrations present in sewage (where available), and associated disease and effects are summarized in Table 6.1.

Viruses

Viruses are submicroscopic infectious agents that require a host in which to reproduce. Once inside the host, the virus reproduces and manifests in illness (EPA 1999c). More than 120 enteric viruses are found in sewage (NAS 1993). The predominant symptoms resulting from enteric virus infection include vomiting, diarrhea, skin rash, fever, and respiratory infection. Most waterborne and seafood-borne diseases throughout the world are caused by viruses (NAS 2000). Many enteric viruses, however, cause infections that are difficult to detect (Bitton 1999). A list of common enteric viruses, including typical

Bacteria	Concentration in Sewage[a] (per 100mL)	Disease[b]	Effects[b]	Infective Dose[c,d]
Campylo-bacter	3,700 -100,000	Gastroenteritis	Vomiting, diarrhea	10^2 - 10^6
Pathogenic *E. coli*	30,000 - 10,000,000	Gastroenteritis	Vomiting, diarrhea, Hemolytic Uremic syndrome (HUS), death in susceptible populations	10^6 - 10^8
Salmonella	0.2 - 11,000	Salmonellosis	Diarrhea, dehydration	10^4 - 10^7
S. typhi		Typhoid fever	High fever, diarrhea, ulceration of the small intestine	10^3 - 10^7
Shigella	0.1 - 1,000	Shigellosis	Bacillary dysentery	10^1 - 10^2
Vibrio cholera		Cholera	Extremely heavy diarrhea, dehydration	10^3 - 10^8
Vibrio non-cholera	10 - 10,000	Gastroenteritis	Extremely heavy diarrhea, nausea, vomiting	10^2 - 10^6
Yersinia		Yersinosis	Diarrhea	10^6

[a] Details in Appendix I
[b] EPA 1999C
[c] Yates and Gerba 1998
[d] Lue-Hing 2003

Table 6.1

Common Pathogenic Bacteria Present in Sewage

Infective dose is defined as the number of pathogens required to cause subclinical infection. Infective doses are typically given as ranges, as the actual infective dose depends on the pathogen strain and an individual's health condition.

concentrations present in sewage (where available), and associated disease and effects are summarized in Table 6.2. Infective doses are not reported; enteric viruses typically are very infectious.

Parasites

Parasites by definition are animals or plants that live in and obtain nutrients from a host organism of another species. The parasites in wastewater that pose a primary public health

Virus Group	Concentration in Sewage[a] (per 100mL)	Disease[b]	Effects[b]
Adenovirus	10 - 10,000	Respiratory disease, gastroenteritis, pneumonia	Various effects
Astrovirus		Gastroenteritis	Vomiting, diarrhea
Noraviruses (includes Norwalk-like viruses)		Gastroenteritis	Vomiting, diarrhea
Echovirus		Hepatitis, respiratory infection, aseptic meningitis	Various effects, including liver disease
Enterovirus (includes polio, encephalitis, conjunctivitis, and coxsackie viruses)	0.05 - 100,000	Gastroenteritis, heart anomalies, aseptic meningitis, polio	Various effects
Reovirus	0.1 - 125	Gastroenteritis	Vomiting, diarrhea
Rotavirus	0.1 - 85,000	Gastroenteritis	Vomiting, diarrhea

[a] Details in Appendix I
[b] EPA 1999C
[c] Yates and Gerba 1998
[d] Lue-Hing 2003

Table 6.2

Common Enteric Viruses Present in Sewage

Enteric viruses are typically very infectious. 1-10 virus particles can cause infection.

concern are protozoa and helminths (NAS 1993). Parasitic protozoa commonly present in sewage include *Giardia lamblia, Cryptosporidium parvum*, and *Entamoeba histolytica*. These protozoa cause acute and chronic diarrhea (NAS 1993). *Giardia* causes giardiasis, which is one of the most prevalent waterborne diseases in the United States (EPA 2001e).

Ranges of typical concentrations of protozoa in sewage and information on infective doses are summarized in Table 6.3. As shown, ingestion of a small number of parasitic protozoa is capable of initiating infection. Therefore, the presence of low levels of parasitic protozoa in wastewater is a greater health concern than are low levels of most pathogenic bacteria (NAS 1993).

Helminths, or parasitic worms, include roundworms, hookworms, tapeworms, and whipworms. These organisms are endemic in areas lacking adequate hygiene. Very little documentation of waterborne transmission of helminth infection is available (NAS 1993). Helminth infections can be difficult to diagnose and often exhibit no obvious symptoms.

Indicator Bacteria and Microbial Pathogens in Sewage

Microbial pathogen concentrations in sewage vary greatly depending on the amount of illness and infection in the community served by the sewer system. The time of year can also be important, as some outbreaks of viral disease are seasonal. Average concentrations of indicator bacteria (e.g., fecal coliform) and other microbial pathogens (enteric viruses and protozoan parasites) shed by an infected person are shown in Table 6.4. These high concentrations illustrate that a single person shedding pathogenic organisms can cause a large pathogen load to be discharged to a municipal sewer system.

6.1.2 Toxics

As described in Section 4.1 of this report, toxics are chemicals or chemical mixtures that, under certain circumstances of exposure, pose a risk to human health. Individuals can suffer chronic health effects resulting from prolonged periods of ingestion or consumption of water, fish, and shellfish contaminated with a toxic substance. Generally, metals and synthetic organic chemicals are the

Table 6.3

Common Parasitic Protozoa Present in Sewage

Parasitic protozoa have very low infective doses which makes their presence in CSO and SSO discharges an important public health concern.

Parasitic Protozoa	Concentration in Sewage[a] (per L)	Disease[b]	Effects[b]	Infective Dose[c]
Cryptosporidium	3 - 13,700	Crypto-sporidiosis	Diarrhea	1 - 150
Entamoeba	4 - 52	Amedbiasis (amoebic dysentery)	Prolonged diarrhea with bleeding, abscess of the liver and small intestine	10 - 20
Giardia	2 - 200,000	Giardiasis	Mild to severe diarrhea, nausea, indigestion	10 - 100

[a] Details in Appendix I
[b] EPA 1999C
[c] Yates and Gerba 1998

Organism	Number per Gram of Feces
Fecal Coliform Bacteria	10^8 to 10^9
Enteric Viruses	10^3 to 10^{12}
Protozoan Parasites	10^6 to 10^7

Table 6.4

Concentration of Indicator Bacteria and Enteric Pathogens Shed by an Infected Individual (Schaub 1995)

This table shows that a single infected person can shed a large number of pathogenic organisms.

toxic substances present in CSO and SSO discharges that can cause human health impacts. Metals and synthetic organic chemicals are introduced into sewer systems through a variety of pathways (Ford 1994). These include permitted industrial discharges, improper or illegal connections, improper drain disposal of chemical remnants, and urban runoff in areas served by CSSs. While the occurrence and concentration of specific toxics in CSOs and SSOs vary considerably from community to community and from event to event depending on site-specific conditions (see Tables 4.4 and 4.5), EPA found no evidence of human health impacts due to toxics in CSO and SSO discharges.

Metals

The metals most commonly identified in wastewater include cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc (AMSA 2003a). In CSSs, storm water can also contribute metals. EPA's Nationwide Urban Runoff Program (NURP) identified copper, lead, and zinc in 91 percent of urban storm water samples collected (EPA 1983a). That is, all three metals were present in 91 percent of samples. Other metals commonly detected in urban runoff include arsenic, cadmium, chromium, and nickel. The NURP Program focused on end-of-pipe samples and therefore did not consider receiving water impacts.

Metals are a human health concern for two reasons. First, metals are persistent in the environment. This creates an increased chance of long-term human exposure once metals are introduced to a waterbody. Second, metals such as arsenic, cadmium, lead, and mercury bioaccumulate in the human brain, liver, fat, and kidneys, causing detrimental effects. Other impacts that can be caused by metals include dermatitis, hair loss, gastrointestinal distress, bone disease, and developmental illnesses.

Synthetic Organic Chemicals

The synthetic organic chemicals that have been identified in CSOs and SSOs include chlorinated aromatic hydrocarbons such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons such as pesticides, and polycyclic aromatic hydrocarbons. Synthetic organic chemicals can be ingested by drinking contaminated water or by eating contaminated fish that have bioaccumulated the chemical. Synthetic organic chemicals can also be absorbed through the skin. Their effects on humans range from skin rash to more serious illnesses including anemia, nervous system and blood problems, liver and kidney problems, reproductive difficulties, and increased risk of cancer.

6.1.3 Biologically Active Chemicals

Recent research efforts have begun to consider the presence of biologically active chemicals—antibiotics, caffeine, hormones, human and veterinary drugs, and steroids—in wastewater (Kümmerer 2001). For the most part, these chemicals have not undergone extensive analysis for environmental fate and transport, human health impacts, or ecological impacts. Concerns about the presence of these biologically active chemicals focus on abnormal physiological processes and reproductive impairments, increased incidence of cancer, development of antibiotic-resistant bacteria, and potential increased toxicity of chemical mixtures. Human health effects, however, are largely unknown (Kolpin et al. 2002).

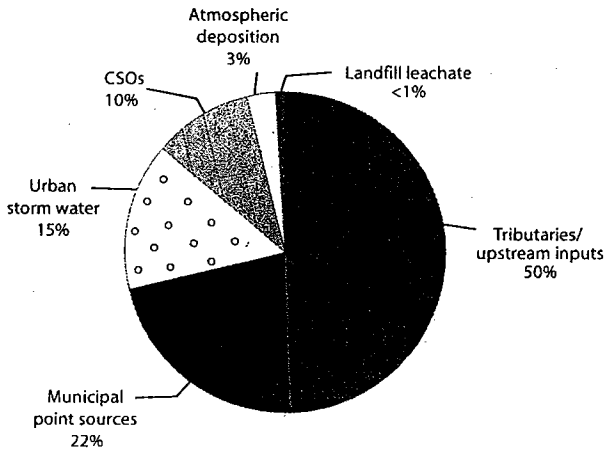
Little is known about the effectiveness of conventional wastewater treatment processes in the removal of these biologically active chemicals. The relative concentrations of these chemicals in CSOs and SSOs are also unknown.

6.2 What Exposure Pathways and Reported Human Health Impacts are Associated with CSOs and SSOs?

Humans may be exposed to the pollutants found in CSOs and SSOs through several pathways. The most common pathways include recreating in waters receiving CSO or SSO discharges, drinking water contaminated by CSO

Sources of Synthetic Organic Chemicals Deposition: NY/NJ Harbor

The New York-New Jersey Harbor Estuary Program sponsored studies to estimate pollutant loads, including loads of synthetic organic chemicals to New York Harbor. As shown, the studies identified six sources of PCB inputs to the harbor. Application of a mass balance water quality food chain model for PCBs indicated that discharges of PCBs to the lower estuary from municipal point sources and CSOs are significant in causing PCB levels in striped bass to exceed the FDA standard for fish consumption (NYNJHEP 1996).



or SSO discharges, and consuming or handling fish or shellfish that have been contaminated by CSO or SSO discharges. Other pathways include direct contact with discharges, occupational exposure, and secondary transmission.

During wet weather events, CSO- and SSO-impacted waterbodies typically receive microbial pathogens and toxics from a variety of other sources including municipal and industrial wastewater discharges, urban storm water runoff, and agricultural nonpoint source discharges. These "interferences" can complicate the identification of specific cause-and-effect relationships between individual CSO or SSO discharges and human health impacts.

6.2.1 Recreational Water

In the United States, millions of people use natural waters (e.g., oceans, lakes, rivers, and streams) each year for a variety of recreational activities. The National Survey on Recreation and the Environment, conducted by the U.S. Forest Service and NOAA, describes nationwide participation in 50 categories of outdoor recreation activities (Leeworthy 2001). The survey estimates the percentage of the population, 16 years of age or older, participating in water-based recreation activities. Participation in more than one activity in a single water-based recreation category is possible (e.g., respondents may report both sailing and canoeing). Data from the most recent version of the survey (the period of July 1999 to January 2001) are presented in Table 6.5.

A number of studies have documented the risks of gastroenteritis among people recreating in water contaminated with microbial pathogens (NAS 1993; Wade et al. 2003). Recreational exposure generally comes from contaminants suspended in the water column entering the body via oral ingestion. Exposure can also occur through the eyes, ears, nose, anus, genitourinary tract, or dermal cuts and abrasions (Henrickson et al. 2001). Contact with and ingestion of ocean water near wastewater or storm drain outfalls have resulted in increases in reported respiratory, ear, and eye symptoms by ocean swimmers and surfers (Corbett et al. 1993; Haile et al. 1999).

As described in Chapter 5, 25 percent of the beaches inventoried in EPA's National Health Protection Survey of Beaches under the BEACH Program had at least one advisory or area closing during the 2002 swimming

Table 6.5

Participation in Water-Based Recreation in U.S. between July 1999 and January 2001

The National Survey on Recreation and the Environment estimates nationwide participation in various outdoor recreation activities, including water-based recreation. Participation in more than one activity is possible.

U.S. Population (16 and Older)	Boating/Floating [a]	Fishing	Swimming [b]
Percent participating	36%	34%	61%
Number in millions	77	72	131

[a] Includes sailing, canoeing, kayaking, rowing, motor-boating, water skiing, personal watercraft use, wind surfing, and surfing.
[b] Includes swimming in freshwater or saltwater, snorkeling, scuba, and visiting a beach.

season. Elevated bacteria levels were cited as the primary cause for 75 percent of these beach advisories or closures. CSOs were reported to be responsible for 1 percent of reported closings and advisories, and 2 percent of advisories and closures that had a known cause. SSOs (including sewer line breaks) were reported to be responsible for 6 percent of all reported advisories and closings, and 12 percent of advisories and closing that had a known cause (EPA 2003a).

Reported Human Health Impacts

A review of CDC Surveillance Summaries identified 74 waterborne disease outbreaks linked to open recreational waters (i.e., rivers, streams, beaches, lakes, and ponds) from 1985 to 2000. A waterborne disease outbreak is defined by CDC as two or more people experiencing similar illness after exposure to a waterborne pathogen. A total of 5,601 cases of illness were attributed to these 74 waterborne disease outbreaks (CDC 1988, 1990, 1992, 1993, 1996a, 1998, 2000, 2002).

The source of the pathogens causing these waterborne disease outbreaks was not identified in CDC's reports. These waterborne disease outbreaks, however, were caused by the types of microbial pathogens found in CSOs and SSOs. Figure 6.1 shows that *Shigella*, which is present in CSOs and SSOs, caused the largest number of recreational water-associated outbreaks having a known cause.

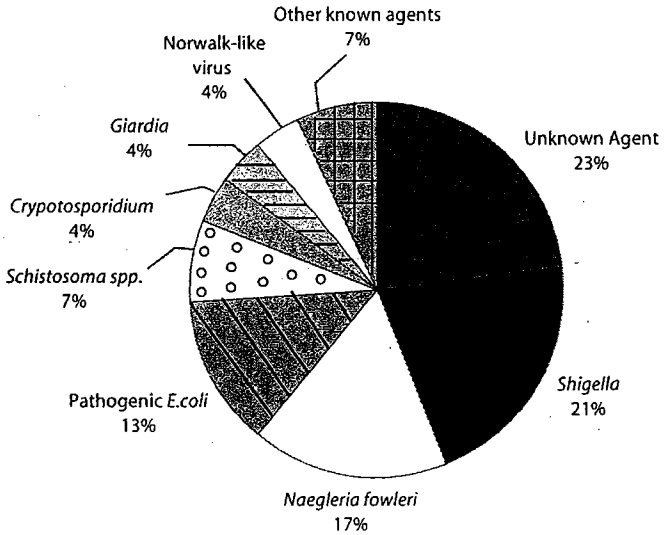
Additional information from CDC Surveillance Summaries on outbreaks linked to recreational exposure in fresh or marine waters contaminated with microbial pathogens is presented in Appendix I.

CDC Surveillance Summaries also identify outbreaks linked to swimming pools or hot tubs. For swimming pools and hot tubs, 191 recreational waterborne disease outbreaks with 14,836 cases of illness were reported to CDC between 1985 and 2000 (CDC 1988, 1990, 1992, 1993, 1996a, 1998, 2000, 2002). This is 265 times the

Figure 6.1

Microbial Pathogens Linked to Outbreaks in Recreational Waters, 1985 - 2000

Shigella was the most commonly identified cause of waterborne disease outbreaks linked to recreational waters between 1985 and 2000. *Shigella* has a relatively low infective dose of 10-100 and is typically found in wastewater in concentrations of 0.1 -1,000 per 100 mL of sewage.



number of illnesses reported for open recreational waters.

Estimated Illnesses at Recognized Beaches

In developing this Report to Congress, EPA found an absence of direct cause-and-effect data relating the occurrence of CSO and SSO discharges to specific human health impacts. Lacking comprehensive data, EPA was able to implement an alternate approach to estimate the annual number of illnesses caused by recreational exposure to CSO and SSO discharges at a small subset of the nation's swimming areas—that is, those recreational beaches recognized by state authorities ("recognized beaches"). EPA's illness estimate was based on existing environmental and recreational use databases. Data limitations made it impossible to develop a comprehensive estimate of illness at all swimming areas at this time, but EPA believes that a significant number of additional illnesses occur in exposed swimmers at many inland and unrecognized beaches.

EPA's estimation of illness at recognized beaches was limited to gastrointestinal illness. EPA employed a multi-step process, including the following:

- Number of recognized beaches using specific management approaches;
- Number of CSO and SSO events impacting recognized beaches;
- Number of individuals exposed annually;
- Average concentration of fecal coliform bacteria at affected beaches;
- Rate of infection for exposed population; and
- Total annual number of gastrointestinal illnesses.

The number of highly credible gastrointestinal illnesses (HCGI) resulting from human exposure to SSOs and CSOs at recognized beaches was estimated by combining information on the number of exposed swimmer days, the concentration of indicator bacteria to which swimmers are exposed, and the Cabelli/Dufour dose-response functions for marine and fresh waters. First, EPA calculated the total number of illnesses caused by CSOs and SSOs, and then attributed them separately to CSO illnesses or SSO illnesses according to the ratio of CSO to SSO events in the BEACH Survey. A more detailed presentation of EPA's methodology is included in Appendix J.

Results from the analyses are presented in Table 6.6. The range shown reflects differences in how compliance rates with beach advisories were estimated. The lower bound uses a compliance rate of 90 percent, and the upper bound uses a compliance rate of 36 percent. As shown, CSOs and SSOs are estimated to cause between 3,448 and 5,576 illnesses annually at the recognized beaches included in this analysis. This estimate captures only a portion of the likely number of annual illnesses attributable to CSO and SSO contamination of recreational waters.

Table 6.6

Estimated Illness Resulting from Recreational Exposure to CSOs and SSOs at Select Beaches

This table shows the portion of the estimated number of annual illnesses attributable to exposure to CSO and SSO contaminated water at state-recognized beaches in the U.S. and its territories.

Source	Lower Bound	Upper Bound
SSOs	2,269	3,669
CSOs	845	1,367
CSO/SSOs	334	540
Total	3,448	5,576

6.2.2 Drinking Water Supplies

Public water systems regulated by EPA, states, and tribes provide drinking water to 90 percent of Americans (EPA 2002e). Approximately 65 percent of the population served by these systems receive water primarily taken from surface water sources such as rivers, lakes, and reservoirs. The remaining 35 percent drink water that originated as groundwater (EPA 1999d).

Reported Human Health Impacts

People can contract waterborne diseases through consumption of municipal drinking water, well water, or contaminated ice. Because drinking water is directly ingested, and it is generally ingested in larger quantities than recreational water that is accidentally ingested, drinking water is an important pathway of exposure. From 1985 to 2000, 251 outbreaks and 462,169 cases of waterborne illness related to contaminated drinking water were reported to CDC (CDC 1988, 1990, 1992, 1993, 1996a, 1998, 2000, 2002). The vast majority of these cases of illness are from a 1993 cryptosporidiosis outbreak in Milwaukee, Wisconsin, which affected an estimated 403,000 people; the CDC did not specifically identify untreated wastewater as contributing to the Milwaukee outbreak.

As shown in Appendix I, EPA identified a subset of 55 of these 251 outbreaks linked to drinking source water contaminated with human sewage or to drinking water taken

SSOs linked to Drinking Water Contamination: Cabool, MO

Between December 15, 1989, and January 20, 1990, residents of and visitors to Cabool, Missouri, experienced 243 cases of diarrhea and four deaths (Swerdlow et al. 1992). The CDC conducted a household survey and concluded that persons drinking municipal water were 18.2 times more likely to develop diarrhea than persons using private well water (Geldreich et al. 1992). Observations suggested that Cabool's SSS was prone to excessive storm water infiltration and therefore was unable to convey all of the wastewater to the treatment facility. As a result, frequent capacity-related SSOs occurred, spilling sewage onto the ground surface in areas over drinking water distribution lines and near water meter boxes. During the outbreak, the water distribution system was under construction, allowing untreated sewage to contaminate the drinking water system (Geldreich et al. 1992).

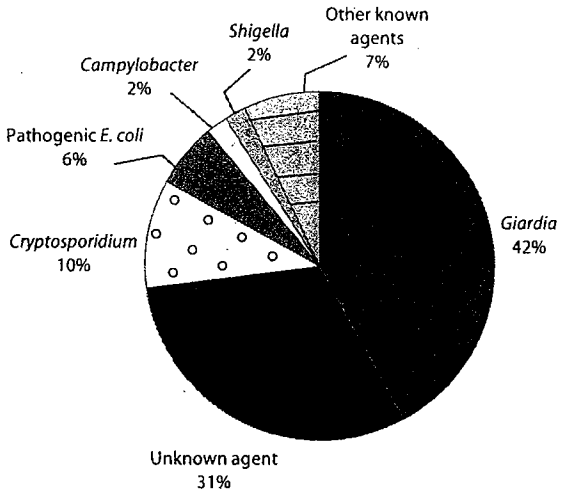


Figure 6.2

Microbial Pathogens Causing Outbreaks Linked to Drinking Water 1985 - 2000

Giardia was responsible for 42 percent of the outbreaks of waterborne disease linked to drinking water.

from rivers, streams, or lakes. Of these, EPA identified 11 outbreaks accounting for 7,764 cases of waterborne illness that CDC linked to drinking water contamination with sewage. Only one of these outbreaks was linked directly to CSOs or SSOs. The outbreaks were caused, however, by the types of microbial pathogens found in CSOs and SSOs. As shown in Figure 6.2, *Giardia*, which is present in significant concentrations in CSOs and SSOs, caused the largest number of outbreaks linked to drinking water. A summary of these outbreaks is provided in Appendix I.

Proximity of CSO Outfalls to Drinking Water Intakes

As described in Chapter 5 and documented in Appendix F, EPA geo-referenced more than 90 percent of all CSO outfalls. EPA compared the locations of these CSO outfalls to drinking water intakes. Only drinking water systems that serve a community on a year-round basis and that use surface water as the primary source of water were considered in this analysis. Approximately 7,519 such systems operate in the United States, of which 6,631 (85 percent) have been

Drinking Water Contaminated by Sewage: Brushy Creek, TX

In July 1998, a lighting strike and the subsequent power outage caused 167,000 gallons of raw sewage to flow into Brushy Creek in Texas (TDH 1998). The sewage contaminated municipal drinking water wells that supplied the community of Brushy Creek. Although the wells are not in direct contact with surface waters (the wells are more than 100 feet deep and encased in cement), drought conditions at the time are thought to have caused water from Brushy Creek to be drawn down into the aquifer and into the wells through a geologic fissure. It is estimated that 60 percent of Brushy Creek's population of 10,000 were exposed to *Cryptosporidium* and approximately 1,300 residents became ill with cryptosporidiosis. Residents of Brushy Creek were supplied water from the contaminated wells for approximately eight days (TDH 1998).

geo-referenced to the NHD and are included in this analysis.

All of the drinking water systems within one mile of any CSO outfall were selected for further analysis. As shown in Table 6.7, EPA identified seven states with outfalls located within one mile upstream of a drinking water intake. Phone interviews were conducted with both the NPDES permit-holder and drinking water authority in the identified areas to confirm the location of the CSO outfall, the status of the CSOs (active/inactive), and the location of the drinking water intake. In many cases, the NPDES permit-holder reported that the CSO was inactive, as a result of sewer separation or other CSO controls.

EPA identified and confirmed 59 active CSO outfalls within one mile of a drinking water intake. One NPDES-permit holder reported that receiving water modeling found that the drinking water intake (located within one mile, but on the opposite side of the river) was not affected by the CSO. Interviews with drinking water authorities found, where a primary drinking water intake was located within one mile of an active CSO, each drinking water authority was aware of the CSO. Further, in all cases, lines of communication existed between the drinking water authority and the NPDES permit-holder. In many cases the drinking water authority indicated adjustments are made to the treatment process during wet weather.

This assessment indicates that CSO's generally do not pose a major risk of contamination to most public drinking water intakes. However, to understand the relationship between a discharge point and a downstream drinking water intake the transport and fate of the discharge between the two points must be modeled under the range of real world flow conditions for that stream reach. Such modeling is beyond the scope of this report.

6.2.3 Fish and Shellfish

Fish and shellfish are widely consumed in the United States and are a valued economic and natural resource (NYNJDEP 2002a). In 1995,

Table 6.7

Association of CSO Outfalls with Drinking Water Intakes

EPA identified 59 CSO outfalls in seven states with outfalls located within one mile upstream of a drinking water intake.

EPA Region	State	Number of CSO Outfalls within 1 mile upstream of a drinking water intake
1	ME	7
2	NY	7
3	PA	19
3	WV	9
4	KY	7
5	IN	3
5	OH	7
	Total:	**59**

Note: EPA was unable to confirm data for an additional 14 outfalls in two states (PA and WV); these outfalls are not included in this table.

the most recent year for which data are available, 77 million pounds of clams, oysters, and mussels were harvested in the coastal United States (NOAA 1997). Shellfish grown in contaminated waters concentrate microbial pathogens and can have higher concentrations than the waters in which they are found. Viable pathogens can be passed on to humans by eating whole, partially cooked, or raw contaminated shellfish.

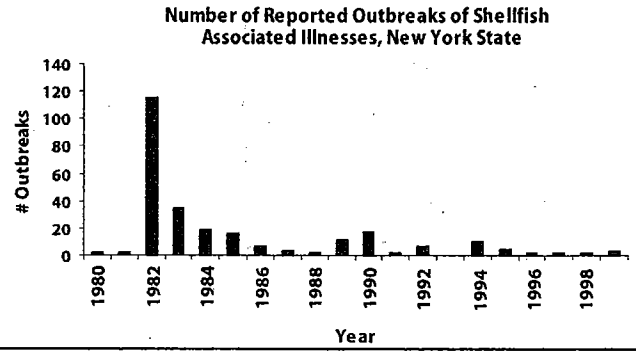
Reported Human Health Impacts

The World Health Organization reported that seafood is involved in 11 percent of all disease outbreaks from food ingestion in the United States (WHO 2001). The most common illness associated with eating sewage-contaminated raw shellfish and fish is gastroenteritis (CERI 1999).

A review of CDC Surveillance Summaries identified eight waterborne disease outbreaks linked to the consumption of contaminated fish or shellfish for the period 1985-2000. These outbreaks resulted in 995 cases of illness (CDC 1990, 1995, 1996b, 1997). More information on these outbreaks is provided in Appendix I. In most cases, the contaminated fish or shellfish were exposed to or grown in sewage-contaminated water. Waste dumped overboard by boaters and improperly treated sewage were the most commonly cited sources of fish and shellfish contamination.

Shellfish-Associated Illness: New York State

The New York State Department of Health compiled data on shellfish-associated illness (most commonly gastroenteritis) recorded in New York State from 1980 to 1999 (NYNJHEP 2002b). The incidence of reported illness has dropped markedly since its peak in 1982. The study was able to trace most of the outbreaks in 1982 to Rhode Island shellfish. The study noted that it is often difficult to identify the source of the shellfish that induced the outbreak. Decreases in shellfish-associated disease are attributed to a number of factors including: improvements in wastewater treatment leading to reductions in concentrations of waterborne microbial pathogens; more restrictions on shellfish harvesting in contaminated areas; and more public awareness of the risks associated with consuming raw shellfish. The study also noted that although shellfish beds are carefully monitored for pathogenic contamination, the levels of toxic contaminants in shellfish, including impacts from marine algal toxins, need additional study.



Direct links to CSO and SSO events as a cause of contamination were not made.

6.2.4 Direct Contact with Land-Based Discharges

Many SSOs discharge to terrestrial environments including streets, parks, and lawns. CSSs and SSSs can also back up into buildings, including residences and commercial establishments. These land-based discharges present exposure pathways that are different than those pathways associated with typical discharges to water bodies. Exposure to land-based SSOs and building backups typically occurs through dermal contact. The resulting diseases are often similar to those associated with exposure through drinking or swimming in contaminated water, but may also include illness caused by inhaling microbial pathogens (CERI 1999).

Reported Human Health Impacts

In general, very few outbreaks associated with direct contact with land-based SSOs have been documented. Land-based SSOs tend to leave visible evidence of their occurrence, such as deposits of sanitary products and other wastes commonly flushed down a toilet. The presence of these items often acts as a deterrent to direct contact with the SSO. Further, municipal response to land-based SSOs often includes cleaning the impacted area by washing the sewage into a nearby manhole or storm drain and disinfecting as needed. This review identified one confirmed outbreak resulting from direct contact with a discharge of untreated sewage in Ocoee, Florida. This event resulted in 39 cases of hepatitis A (Vonstille 1993).

6.2.5 Occupational Exposures

Many occupational settings occasionally expose personnel to microbial pathogens. These include restaurants and food processing, agriculture, hospitals and healthcare, emergency response, and wastewater treatment.

Wastewater treatment plant workers and public works department personnel operate and maintain wastewater treatment facilities and respond to CSO or SSO events. In doing so, they may be exposed to microbial pathogens present in CSOs and SSOs. Police, firefighters, rescue divers, and other emergency response personnel also face exposure to CSOs and SSOs. Depending on the context in which the overflow event occurs, exposure can occur through inhalation, ingestion, and dermal contact. Adherence to good personal hygiene and the appropriate use of personal protective equipment are important in minimizing the potential for injury or illness.

Reported Human Health Impacts

Comprehensive epidemiologic research on waterborne illness associated with occupational exposure to untreated wastewater is lacking. Some researchers believe that wastewater workers may experience increased numbers of bacterial, viral, and parasitic infections without exhibiting signs or symptoms of illness. These are called "sub-clinical" infections (AFSCME 2003). One study concluded that the lowest rates

of illness are found among workers employed in wastewater treatment for less than five years, the highest rates in workers with five to 10 years of exposure, and lower rates again in workers with 15 years or more of exposure (Dowes et al. 2001). An explanation for this is that workers build immunity to many of the microbial pathogens present in the work environment over the course of their employment, and those who become very ill no longer work in the plant. This phenomenon is also known as the "healthy worker effect."

In general, the effect of microbial pathogens, other than hepatitis A, on wastewater workers has been given little attention, and "there have been few epidemiologic studies conducted among sewage workers in the U.S. to determine the actual prevalence and types of infections" (AWR 2001).

One confirmed waterborne disease outbreak through occupational exposure was identified from the review of CDC Surveillance Summaries. In 1982, 21 cases of gastrointestinal illness were identified among 55 police and fire department scuba divers training in sewage-contaminated waters (CDC 1983). The divers developed gastrointestinal disease more than four times as frequently as nondiving firefighters, the control group in the study. Although the causes of illness in many divers were not identified, gastrointestinal parasites were found in 12 divers: *Entamoeba histolytica* in five divers, and *Giardia lamblia* in seven divers.

6.2.6 Secondary Transmission

An individual who contracts an infection from exposure to a waterborne microbial pathogen may, in turn, infect other individuals, regardless of whether symptoms are apparent in the first individual. This is commonly referred to as "secondary transmission." The rate of secondary transmission depends largely on the particular microbial pathogen. Illnesses caused by secondary transmission are not included in CDC Surveillance Summaries, which list only primary illnesses.

Reported Human Health Impacts

Secondary transmission statistics obtained from a variety of waterborne and non-waterborne disease outbreaks are shown in Table 6.8 (NAS 1998). As presented, the secondary attack ratio represents the ratio of secondary cases to primary cases.

6.3 Which Demographic Groups Face the Greatest Risk of Exposure to CSOs and SSOs?

Several demographic groups face increased risk of exposure to the pollutants in CSOs and SSOs because they are more likely to spend time in locations impacted by such discharges. These groups include people recreating in CSO- and SSO-impacted waters, subsistence fishers, shellfishers, and wastewater workers. The sections that follow describe exposure risks for each of these groups in greater detail. This information is

Table 6.8

Examples of Secondary Transmission from Waterborne and Non-Waterborne Disease Outbreaks (NAS 1998)

An individual who contracts an infection may, in turn, infect other individuals. This table shows for every two individuals infected with Norwalk virus, one to two individuals can become infected via secondary transmission.

Microbial Pathogen	Secondary Attack Ratio	Source of Outbreak
Cryptosporidium	0.33	Contaminated apple cider
Shigella	0.28	Child day care center
Rotavirus	0.42	Child day care center
Giardia	1.33	Child day care center
Unspecified virus causing viral gastroenteritis	0.22	Contaminated drinking water
Norwalk virus	0.5 - 1.0	Contaminated recreational water

presented based on the availability of literature documenting each group's potential for exposure, rather than on the relative sensitivity of each population to the pollutants in CSO and SSO discharges.

6.3.1 Swimmers, Bathers, and Waders

Swimming in marine and fresh water has been linked directly to diseases caused by the microbial pathogens found in wastewater (Cabelli et al. 1982). For example, a 1998 study comparing bathers and non-bathers found that 34.5 percent of gastroenteritis and 65.8 percent of ear infections reported by participants were linked to bathing in marine waters contaminated with sewage. The percentage of people who lost at least one day of normal activity due to contacting one of the illnesses studied ranged from 7 to 26 percent (Fleisher et al. 1998).

Many variables influence the exposure of people to pathogens in recreational water. These factors include whether people swim or wade, the type of pathogens present at the time of exposure, the route of exposure (ingestion or skin contact), and individual susceptibility to waterborne disease (WSDH 2002).

6.3.2 Subsistence and Recreational Fishers

Subsistence and recreational fishers and their families tend to consume more fish and shellfish than the general population, and men tend to consume more fish and shellfish than women (Burger et al. 1999). Further, in areas conducive to fishing, people with lower education levels or lower income levels consume more fish and shellfish, as it is often an inexpensive source of protein (Burger et al. 1999).

Cultural preferences influence the amount and frequency of fish as well as shellfish consumption and the methods for preparing and serving fish and shellfish. For example, a study of two Native American groups in Puget Sound in Washington found that these groups consumed fish at much higher rates than the general public and at rates greater than those recommended by EPA (Toy et al. 1996). Asians and Pacific Islanders generally consume fish at much higher rates than the general United States population (Sechena et al. 1999). In addition, cooking methods and consumption rates of parts of the fish that tend to concentrate toxins (e.g., skin, head, organs, and fatty tissue) can increase the risk of human health impacts from consuming

contaminated fish and shellfish (e.g., Wilson et al. 1998; WDNR 2003).

Fish and shellfish advisories target recreational and subsistence fishers. Despite warnings and advisories, however, many fishers consume their catch. May and Burger (1996) found that a majority of urban and suburban recreational fishers ignored warnings issued by the New York State Department of Health and the New Jersey Department of Environmental Protection.

6.3.3 Wastewater Workers

Wastewater workers are more likely to come into contact with untreated wastewater than the general public, but there is insufficient data to determine whether wastewater workers or their families face an increased risk of illness as a result of this exposure. Although there is disagreement regarding the benefits of additional immunization above those recommended by CDC for the adult general population (i.e., diptheria and tetanus), WERF (2003b) asserts that wastewater workers should be vaccinated for both Hepatitis A and B.

6.4 Which Populations Face the Greatest Risk of Illness from Exposure to the Pollutants Present in CSOs and SSOs?

Certain demographic groups, including pregnant women, children, individuals with compromised immune systems, and the elderly, may be at greater risk than the general population for serious illness or a fatal outcome resulting from exposure to the types of pollutants present in CSOs and SSOs. Specific characteristics of these demographic groups that make them particularly susceptible to these illnesses are discussed in more detail in the following sections. These sensitive groups represent almost 20 percent of the U.S. population (Gerba et al. 1996). Also, tourists and travelers may be more prone to waterborne illnesses than local residents (EPA 1983b). EPA research has found that when exposed to pathogens found in local sewage, local residents have been shown to develop fewer symptoms than non-residents or visitors.

6.4.1 Pregnant Women

During pregnancy, women appear to be at greater risk of more serious disease outcomes from exposure to the types of enteric viruses found in CSOs and SSOs (Reynolds 2000). Waterborne diseases contracted during pregnancy may result in transfer of the illness to the child either *in utero*, during birth, or shortly after birth (Gerba et al. 1996).

6.4.2 Children

The incidence of several waterborne infectious diseases caused by the types of pollutants present in CSO and SSO discharges is significantly greater in infants and children than in the general population (Laurenson et al. 2000). Factors contributing to the susceptibility of children include children's naturally immature immune systems and child-associated behaviors that result in abnormally high ingestion rates during recreational exposure to contaminated water (Laurenson et al. 2000). For example,

children frequently splash or swim in waters that would be considered too shallow for full-body immersion by adults (EPA 2001b).

6.4.3 Immunocompromised Groups

People with compromised immune systems, such as those with AIDS, organ transplant recipients, and people undergoing chemotherapy, are more sensitive than the general public to infection and illness caused by the types of pollutants present in CSO and SSO discharges (Gerba et al. 1996). Using Wisconsin death certificate data, Hoxie et al. (1997) analyzed cryptosporidiosis-associated mortality in AIDS patients following the 1993 Milwaukee outbreak that affected an estimated 403,000 people. The researchers found that AIDS was the underlying cause of death for 85 percent of post-outbreak cryptosporidiosis-associated deaths among residents of the Milwaukee area. Further, the researchers found that AIDS mortality increased significantly in the six months immediately after the outbreak, then decreased to levels lower than expected, and then returned to expected levels. This suggests that some level of premature mortality was associated with the outbreak.

6.4.4 Elderly

The elderly are at increased risk for waterborne illness due to a weakening of the immune system that occurs with age (Reynolds 2000). Studies have found that people over 74 years old, followed by those between 55 and 74, and then by children under 5, respectively experience the highest mortality from diarrhea as a result of infection by waterborne or foodborne illness (Gerba et al. 1996). Studies of a giardiasis outbreak in Sweden that occurred when untreated sewage contaminated a drinking water supply found people over 77 years old faced an especially high risk of illness (Ljungstrom and Castor 1992).

6.5 How are Human Health Impacts from CSOs and SSOs Communicated, Mitigated, or Prevented?

A variety of programs are in place to reduce human health impacts associated with exposure to microbial pathogens and toxics. These programs generally involve preventive measures enacted by public health officials, including: communication efforts to warn the public about risk and threats; and monitoring, reporting, and tracking activities. This section is focused on agencies, activities, and programs designed to communicate, mitigate, or prevent potential human health impacts from exposure to CSOs and SSOs.

6.5.1 Agencies and Organizations Responsible for Protecting Public Health

Numerous agencies and organizations have responsibilities for monitoring, tracking, and notifying the public of potential human health impacts. These include federal and state agencies, local public health officials, owners and operators of municipal wastewater

ATTACHMENT C

GUIDANCE FOR DRAFTING JUDICIAL CONSENT DECREES

EPA GENERAL ENFORCEMENT POLICY # GM - 17

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY

EFFECTIVE DATE: OCT 19 1983

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vary. The following example demonstrates one form of such a section.

EXAMPLE

> The following terms used in this consent decree shall be defined as follows:
>
> a. The term "days" as used herein shall mean calendar days.
>
> b. The term "permanently cease operation", when used in such phrases as "permanently cease operation of the six (6) open hearth furnaces", shall mean the complete cessation of production at the relevant source and the termination of all power or fuel to the source.

E. Compliance Provisions

1. Generally

Consent decrees must require compliance with applicable statutes or regulations and commit the defendant to a particular remedial course of action by a date certain. Consent decrees negotiated by EPA contain compliance provisions whenever it is necessary for defendant to take remedial action to cure or prevent violations unless no injunctive relief is necessary to obtain compliance with applicable law (i.e., penalties only case).

Compliance provisions set out what steps the defendant must take to remedy violations of various environmental statutes and usually define methods EPA can use to determine the defendant's success in meeting these provisions. The specific compliance provisions of each decree will vary depending on the facts of the specific case and the media

involved. Drafters should consult media-specific policies for guidance.

Compliance provisions should specify the standard or level of performance which a source ultimately must demonstrate it has met. Other than interim standards to be attained until final compliance is achieved, a decree should not set a standard less stringent than that required by applicable law because a decree is not a substitute for regulatory or statutory change.

You should avoid including compliance provisions which require the defendant to comply solely by installing certain equipment, unless specific technical standards are required by applicable regulations. Such provisions should require compliance with the appropriate standard as well. Such a provision may allow the defendant to argue that installation of the equipment fulfills the requirements of the consent decree even if the equipment fails to achieve compliance with statutes and regulations. You may include provisions which require the installation of necessary control technology. However, the provisions must be clear that installation of specific equipment does not relieve the defendant from the responsibility for achieving and maintaining compliance with the applicable laws and regulations.1/

1/ Under some statutes, CERCLA, for example, standards for clean-up are rarely available. When the decree involves future clean-up activities rather than cash settlements, the decree may usefully specify continuing State/EPA responsibilities for determining future clean-up activity.

An important part of the compliance section of a decree is the inclusion of provisions which provide a means of monitoring the defendant's performance. Depending upon the performance standard required by the decree, monitoring provisions might, for example, require periodic tests or reports by the defendant. Test protocols may be set out in technical appendices to the decree. Generally, in choosing monitoring provisions you should consider such factors as the impact on Agency resources of different monitoring requirements and the ease with which the Agency can proceed with monitoring, as well as the need for some type of Federal oversight to ensure that the defendant is addressing noncompliance problems adequately. For example, you will want to provide for site entry and access and document review by the Agency in the decree. You should not waive the Agency's right to assert or utilize its statutory authorities, such as right of entry or document production.

EXAMPLE

> Any authorized representative or contractor of U.S. EPA or Intervenors, upon presentation of his credentials, may enter upon the premises of the Karefull Works at any time for the purpose of monitoring compliance with the provisions of the Consent Decree.

The decree should specify timetables or schedules for achieving compliance requiring the greatest degree of remedial action as quickly as possible. Such timetables are particularly relevant in decrees which mandate construction the defendant must undertake or cleanup the defendant must accomplish.

These schedules should include interim dates so that the Agency can monitor the defendant's progress toward compliance.

EXAMPLE

III. Sinter Plant

A. Applicable Emissions Limitations

1. Emissions from the sinter plant at Defendant's Karefull Works shall comply with the emission limitations in 25 Pa. Code §§123.41, 123.3 and 123.1 as follows:

a. Visible emissions from any sinter plant stack shall not equal or exceed 20% opacity for a period or periods aggregating more than three (3) minutes in any sixty (60) minute period and shall not equal or exceed 60% at any time, as set forth in 25 Pa. Code §123.41.

b. Visible emissions from any part of sinter plant operations shall not equal or exceed 20% opacity for a period of periods aggregating more than three (3) minutes in any sixty (60) minute period and shall not equal or exceed 60%, as set forth in 25 Pa. Code §123.41.

c. Mass emissions from the sinter plant windboxes and from all gas cleaning devices installed to control emissions at the sinter plant shall not exceed ____ grains (filterable) per dry standard cubic foot (the applicable emission limitation).

d. Fugitive emissions from any source of such emissions at the sinter plant shall not exceed the emissions limitation set forth in 25 Pa. Code §123.1

2. The air pollution control equipment described below shall be installed in accordance with the following schedule:

Submit permit application to DER and to EPA for approval	November 1, 1980
Issue purchase orders	May 1, 1981

5. Stipulated Penalties

Most decrees should contain provisions for stipulated penalties. These provisions encourage compliance and simplify enforcement by providing a significant, clearly defined sanction in the event the defendant violates a provision of the decree. Stipulated penalties are appropriate for violation of the following types of provisions:

a) final and interim compliance requirements,

b) reporting, testing or monitoring requirements,

c) any other performance requirements (including requirements to pay civil penalties).

Provisions for stipulated penalties should include the amount of the penalty, how the penalty should be paid, and to whom the penalty should be paid. To set the amount of a proposed stipulated penalty, you should be guided by applicable statutes, regulations and EPA policies. Normally, defendants should pay stipulated penalties by delivering a cashiers check made payable to "Treasurer United States of America" to the appropriate Regional Counsel.

The decree may also provide that the court issuing the decree will resolve disputes between the parties as to liability for and the amount of an assessed stipulated penalty. The provision should also make clear that stipulated penalties are not the plaintiff's exclusive remedy for the defendant's violation of the decree and that the plaintiff reserves its right to seek injunctive relief.

EXAMPLE

Failure by the defendant to achieve full compliance as required by Paragraphs IV.A.1 through 9, except as excused pursuant to Paragraph V herein (force majeure), shall require defendant to pay a stipulated penalty of $7,500 per day for each day that such failure continues.

Stipulated penalties are payable upon demand as follows:

Cashiers check payable to: Treasurer, United States of America

Address for payment: USEPA, Region III
Curtis Building, Second Floor
6th and Walnut Streets
Philadelphia, PA. 19106
Attn: Regional Counsel

Any dispute with respect to defendant's liability for a stipulated penalty shall be resolved by this court. The provisions of this paragraph shall not be construed to limit any other remedies, including but not limited to institution of proceedings for civil or criminal contempt, available to plaintiff or intervenors for violations of this consent decree or any other provision of law.

You may want to provide for stipulated penalties which escalate based on the number of days the source is not in compliance or on the amount of excess emissions or effluents discharged by the source in violation of the decree. For example, for days 1 through 30 of violation the stipulated penalty could be $1000 per day. This could increase to $2000 per day for days 30 through 60 and so on. Similarly, excess discharges or emissions could be expressed as a percentage over the daily limitation and a scale could be devised for these as well. For example, discharges which are less than 10% over the daily discharge limitation would be subject to a stipulated penalty of $500, from 10% to 25%, $1000 and so forth.

Another approach which may aid the negotiation process is to use a stipulated penalties provision which allows the payment of penalties for interim violations into some kind of escrow account. The clause could provide for the return of these payments to the defendant if timely final compliance is achieved and the terms of the consent decree are satisfied. If such an escrow account arrangement is used, EPA staff should review the escrow agreement itself. The agreement should clearly give the escrow agent the authority to turn the fund over to EPA in the event of noncompliance.

6. Force Majeure

The purpose of a force majeure clause is to excuse the defendant's performance pursuant to the decree because of circumstances beyond the defendant's control (e.g., acts of God). Therefore, such a clause should not be included in a decree unless the defendant insists on its inclusion.

Although a force majeure clause is something the defendant may want in the decree, it normally will be to EPA's negotiating advantage if Agency representatives draft the clause. Generally, the following elements should be included in drafting such a clause.

a) The clause must clearly limit excused delays in performance to those events which are beyond the control of the defendant. The decree may define specifically which circumstances would trigger the force majeure clause. Arriving at a list of such circumstances, however, may consume a good deal

ATTACHMENT D

EC-R 1998-159
III-A-01

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 10 1998

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

MEMORANDUM

SUBJECT: Issuance of Final Supplemental Environmental Projects Policy

FROM: Steven A. Herman
Assistant Administrator

TO: Regional Administrators

I am pleased to issue the final Supplemental Environmental Projects (SEP) Policy, the product of almost three years of experience implementing and fine-tuning the 1995 Interim Revised SEP Policy. It is also the product of the cooperative effort of the SEP Workgroup, comprised of representatives of the Regions, various OECA offices, OGC and DOJ. This Policy is effective May 1, 1998, and supersedes the Interim SEP Policy.

Most of the changes made to the Interim SEP Policy are clarifications to the existing language. There are no radical changes and the basic structure and operation of the SEP Policy remains the same. The major changes to the SEP Policy include:

1. Community Input. The final SEP Policy contains a new section to encourage the use of community input in developing projects in appropriate cases and there is a new penalty mitigation factor for community input. We are preparing a public pamphlet that explains the Policy in simple terms to facilitate implementation of this new section.

2. Categories of Acceptable Projects. The categories of acceptable projects have remained largely the same, with some clarifications and a few substantive changes. There is now a new "other" category under which worthwhile projects that do not fit within any of the defined categories, but are otherwise consistent with all other provisions of the SEP Policy, may qualify as SEPs with advance OECA approval. The site assessment subcategory has been revised and renamed to "environmental quality assessments." The environmental management system subcategory has been eliminated.

3. Use of SEPS to Mitigate Stipulated Penalties. The final SEP Policy prohibits the use of SEPs to mitigate claims for stipulated penalties, but does indicate that in certain defined extraordinary circumstances, I may approve a deviation from this prohibition.

4. Penalty Calculation Methodology. The penalty calculation steps have been better defined and broken into five steps rather than three. A calculation worksheet, keyed to the text of the Policy, has been added. The penalty mitigation guidelines have not been substantively changed, only clarified.

5. Legal Guidelines. The legal guidelines have been revised to improve clarity and provide better guidance. The nexus legal guideline has been revised to make it easier to apply. The fifth legal guideline concerning appropriations has been revised and subdivided into four sections.

Questions regarding the final SEP Policy should be directed to Ann Kline (202-564-0119) in the Multimedia Enforcement Division.

Attachment

cc: (w/attachment)
OECA Office Directors
Regional Counsels, Regions I-X
Director, Office of Environmental Stewardship, Region I
Director, Division of Enforcement and Compliance Assurance, Region II
Director, Compliance Assurance and Enforcement Division, Region VI
Director, Office of Enforcement, Compliance and Environmental Justice, Region VIII
Regional Enforcement Coordinators, Regions I-X
Chief, DOJ, EES

SEP Workgroup Members
David Hindin, Chair, EPTDD
Leon Acierto, V
Christopher Day, III
Joe Boyle, V
Lourdes Bufill, WED
Becky Dolph, VII
Karen Dworkin, DOJ, EES
Gwen Fitz-Henley, IV
Melanie Garvey, FFEO
Mark Haag, DOJ, PSLS
Tanya Hill, OGC
Leslie Jones, OSRE
Maureen Katz, DOJ, EES
Amelia Katzen, I
Ann Kline, MED
Gerard Kraus, MED
Sylvia Liu, DOJ, PSLS
Amy Miller , IX
Peter Moore, MED
Mike Northridge, OSRE
Reginald Pallesen, V
Rudy Perez, II
Erv Pickell, AED
JoAnn Semones, IX
Efren Ordonez, VI
Lawrence Wapensky, VIII

EPA SUPPLEMENTAL ENVIRONMENTAL PROJECTS POLICY

Effective May 1, 1998

A. INTRODUCTION

1. Background

In settlements of environmental enforcement cases, the U.S. Environmental Protection Agency (EPA) requires the alleged violators to achieve and maintain compliance with Federal environmental laws and regulations and to pay a civil penalty. To further EPA's goals to protect and enhance public health and the environment, in certain instances environmentally beneficial projects, or Supplemental Environmental Projects (SEPs), may be part of the settlement. This Policy sets forth the types of projects that are permissible as SEPs, the penalty mitigation appropriate for a particular SEP, and the terms and conditions under which they may become part of a settlement. The primary purpose of this Policy is to encourage and obtain environmental and public health protection and improvements that may not otherwise have occurred without the settlement incentives provided by this Policy.

In settling enforcement actions, EPA requires alleged violators to promptly cease the violations and, to the extent feasible, remediate any harm caused by the violations. EPA also seeks substantial monetary penalties in order to deter noncompliance. Without penalties, regulated entities would have an incentive to delay compliance until they are caught and ordered to comply. Penalties promote environmental compliance and help protect public health by deterring future violations by the same violator and deterring violations by other members of the regulated community. Penalties help ensure a national level playing field by ensuring that violators do not obtain an unfair economic advantage over their competitors who made the necessary expenditures to comply on time. Penalties also encourage regulated entities to adopt pollution prevention and recycling techniques in order to minimize their pollutant discharges and reduce their potential liabilities.

Statutes administered by EPA generally contain penalty assessment criteria that a court or administrative law judge must consider in determining an appropriate penalty at trial or a hearing. In the settlement context, EPA generally follows these criteria in exercising its discretion to establish an appropriate settlement penalty. In establishing an appropriate penalty, EPA considers such factors as the economic benefit associated with the violations, the gravity or seriousness of the violations, and prior history of violations. Evidence of a violator's commitment and ability to perform a SEP is also a relevant factor for EPA to consider in establishing an appropriate settlement penalty. All else being equal, the final settlement penalty will be lower for a violator who agrees to perform an acceptable SEP compared to the violator who does not agree to perform a SEP.

The Agency encourages the use of SEPs that are consistent with this Policy. SEPs may not be appropriate in settlement of all cases, but they are an important part of EPA's enforcement program. While penalties play an important role in environmental protection by deterring violations and creating a level playing field, SEPs can play an additional role in securing significant environmental or public health protection and improvements. SEPs may be particularly appropriate to further the objectives in the statutes EPA administers and to achieve other policy goals, including promoting pollution prevention and environmental justice.

2. Pollution Prevention and Environmental Justice

The Pollution Prevention Act of 1990 (42 U.S.C. § 13101 et seq., November 5, 1990) identifies an environmental management hierarchy in which pollution "should be prevented or reduced whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort ..." (42 U.S.C. §13103). Selection and evaluation of proposed SEPs should be conducted generally in accordance with this hierarchy of environmental management, i.e., SEPs involving pollution prevention techniques are preferred over other types of reduction or control strategies, and this can be reflected in the degree of consideration accorded to a defendant/respondent before calculation of the final monetary penalty.

Further, there is an acknowledged concern, expressed in Executive Order 12898 on environmental justice, that certain segments of the nation's population, i.e., low-income and/or minority populations, are disproportionately burdened by pollutant exposure. Emphasizing SEPs in communities where environmental justice concerns are present helps ensure that persons who spend significant portions of their time in areas, or depend on food and water sources located near, where the violations occur would be protected. Because environmental justice is not a specific technique or process but an overarching goal, it is not listed as a particular SEP category; but EPA encourages SEPs in communities where environmental justice may be an issue.

3. Using this Policy

In evaluating a proposed project to determine if it qualifies as a SEP and then determining how much penalty mitigation is appropriate, Agency enforcement and compliance personnel should use the following five-step process:

(1) Ensure that the project meets the basic definition of a SEP. (Section B)
(2) Ensure that all legal guidelines, including nexus, are satisfied. (Section C)
(3) Ensure that the project fits within one (or more) of the designated categories of SEPs. (Section D)
(4) Determine the appropriate amount of penalty mitigation. (Section E)
(5) Ensure that the project satisfies all of the implementation and other criteria. (Sections F, G, H, I and J)

ATTACHMENT E

DAVID W. SHAPIRO (NYSB 2054054)
United States Attorney

JOHN C. CRUDEN
Acting Assistant Attorney General
Environment and Natural Resources Division

PAULINE MILIUS
R. JUSTIN SMITH (D.C. Bar # 453119)
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Attorneys for United States

IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NORTHERN CALIFORNIA RIVER WATCH, INC. Plaintiff, v. CITY OF FORTUNA Defendant	No. C00-3318 CAL UNITED STATES' NOTICE OF MOTION AND MOTION TO VACATE ENTRY OF CONSENT DECREE AND ORDER FURTHER NEGOTIATIONS DATE: January 11, 2001 TIME: 9:00 A.M. COURTROOM: 4

Please take notice that on January 11, 2001 at 9:00 am or as soon thereafter as counsel can be heard, the United States of America will move this Court, in Courtroom 4, United States Court House, 450 Golden Gate Avenue, San Francisco, California, as follows:

To vacate entry of the Consent Decree in this action and order that the parties negotiate to

address objections set forth by the United States.

The reasons and authority supporting the United States' motion are set forth in the accompanying memorandum.

Respectfully submitted,

DAVID W. SHAPIRO
United States Attorney

JOHN C. CRUDEN
Acting Assistant Attorney General

DATED: _____

_____
PAULINE MILIUS
R. JUSTIN SMITH
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Attorneys for United States

IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NORTHERN CALIFORNIA RIVER WATCH, INC. Plaintiff, v. CITY OF FORTUNA Defendant	No. C00-3318 CAL UNITED STATES' MEMORANDUM IN SUPPORT OF MOTION TO VACATE ENTRY OF CONSENT DECREE AND ORDER FURTHER NEGOTIATIONS DATE: January 11, 2001 TIME: 9:00 A.M. COURTROOM: 4

1. The United States hereby objects to the consent decree entered in this action. The United States requests that the Court vacate entry of the decree and order the parties to negotiate further in an effort to reach an agreement that provides for more definite relief.

2. The Clean Water Act ("Act") contemplates that the United States will assist courts in determining whether a citizen suit consent judgment complies with the Act and the general standards for entry of consent judgments. Clean Water Act section 505 provides the United States 45 days to review and comment on any proposed consent judgment in a citizen suit to which the United States is not a party. 33 U.S.C. 1365(c)(3); Sierra Club, Inc. v. Electronic Controls Design, Inc., 909 F.2d 1350, 1352 n.2 (9th Cir. 1990) ("Section 505(c)(3) of the Clean Water Act, 33 U.S.C. § 1365(c)(3), requires that the United States be given 45 days to review a proposed consent judgment in an action to which it is not a party. If it finds that the proposed judgment is not in accordance with the Act, the United States can object."). That provision, enacted into law in 1987, was designed specifically to give the United States more power to oversee and monitor the entry of consent judgments in such citizen suits. 133 Cong. Rec. Part II, S. 737 (daily ed. Jan. 14, 1987) (statement of Senator Chafee that the amendment would allow the United States to object to any "abusive, collusive, or inadequate settlements."). In its review of settlements of citizen enforcement actions, the United States seeks to ensure that the settlements, *inter alia*, serve the public interest, comply with the law, and adequately address any ongoing environmental harms.

3. As set forth in the United States' Unopposed Motion for Time In Which To Determine Whether to Seek Additional Relief, the Court's previous entry of the consent decree in this action occurred before the conclusion of the 45-day review period. The United States subsequently sought an additional two weeks in which to conduct its review. That request was unopposed, and was granted by the Court. The United States has now reviewed the decree and discussed it with

the parties; in those discussions, the United States sought to obtain the parties' agreement to modify the decree to address the concerns set forth below. Those discussions were unsuccessful. Accordingly, the United States now objects to the entry of the decree.

4. A district court reviews a proposed consent judgment to determine whether it is fair, reasonable and equitable, and does not violate the law or public policy. Sierra Club v. Electronic Controls Design, Inc., 909 F.2d 1350, 1355 (9th Cir. 1990); Ibarra v. Texas Employment Commission, 823 F.2d 873, 878 (5th Cir. 1987); Citizens for a Better Environment v. Gorsuch, 718 F.2d 1117, 1126 (D.C. Cir. 1983), cert. denied, 467 U.S. 1219 (1984). When reviewing a proposed judgment in an action between private parties commenced to vindicate public interests, such as this one, the district court should be particularly vigilant. See Janus Films, Inc. v. Miller, 801 F.2d 578, 582 (2d Cir. 1986). A court's authority to approve a proposed consent judgment is always constrained by the statutory framework underlying the action. As the Supreme Court explained in Local No. 93, International Association of Firefighters v. City of Cleveland, 478 U.S. 501, 525 (1986) (citations omitted):

> [A] federal court is more than "a recorder of contracts" from whom parties can purchase injunctions; it is "an organ of government constituted to make judicial decisions * * * ." [T]he consent decree must "come within the general scope of the case made by the pleadings," and must further the objectives of the law upon which the complaint was based.

Thus, "parties may [not] agree to take action that conflicts with or violates the statute upon which the complaint was based." Id. at 526; see also Electronic Controls Design, 909 F.2d at 1355 (stating that a Clean Water Act settlement must be consistent with the law); Citizens for a Better Environment, 718 F.2d at 1126 (holding that a consent judgment must be fair and consistent with

the public interest). In light of the statutory role of the Department of Justice and the Environmental Protection Agency in reviewing and commenting on consent decrees, the risk that citizens' groups and defendants will not adequately consider the public interest in crafting relief, and the particular expertise of the Department of Justice and Environmental Protection Agency in drafting consent decrees and addressing violations of the Clean Water Act, the Court's review of the concerns set forth in the United States' comments below should be particularly searching, more so than that which the Court would ordinarily accord to a consent decree proposed by the parties.

5. The consent decree placed before the Court is gravely inadequate. The United States has not at this time made an independent assessment as to the extent of the violations of the Clean Water Act that have occurred in this case. However, plaintiffs' complaint alleges violations in the City's wastewater treatment system, including numerous spills of untreated sewage; the decree appears to be intended to address such violations. The United States believes that the injunctive relief provided for in the decree is so vague and lacking in binding force that it will not resolve whatever matters it is intended to redress. The decree is also drafted in such a way that it will be exceptionally difficult for this Court to apply and enforce. It follows that the decree will not achieve its apparent purpose of eliminating wastewater treatment violations by the City. It is accordingly not in the public interest.

6. The decree requires only that, "for a period of five (5) years from the effective date of the Consent Decree," the City use its "best efforts to commence and complete the Capital Improvement Projects listed in Exhibit A hereto to improve its sewer collection system and

wastewater treatment plant in accordance with the schedule set forth therein." (No schedule is in fact set forth in Exhibit A.) The decree provides that the City shall not be deemed to have violated this requirement "to the extent that compliance has been prevented by" a lengthy series of events, including "lack of available City monies to design or construct such Capital Improvement Projects." Consent Decree, para. 6.

7. The decree's exception for "lack of available City monies" is so vague that it potentially renders the decree's relief illusory. The decree would appear to permit the City to determine during every budget cycle whether it wishes to engage in the listed Capital Improvement Projects. The decree's requirement that the City only exercise its "best efforts" to commence and complete the Projects could likewise render the decree's relief illusory, and would appear to allow the City to not accomplish the Projects during the life of the consent decree. At the conclusion of the five-year period covered by the decree, the City's obligations would be at an end, even if no work had been done.

8. The United States believes that the parties can and should provide additional detail to the decree and thereby ensure that the relief it sets forth meets the Act's standards. The details should take the form of specific deadlines for completion of particular projects. A common provision in cases of this nature would require the defendant to fund an independent review and audit of their wastewater treatment and to agree to correct any deficiencies noted. If appropriate, projects could be grouped or tiered by priority level, or listed as contingency measures if certain steps do not suffice to eliminate violations. The exception for "lack of available City monies" should be removed from the decree. To the extent that the City is constrained by its finances,

that should only be a consideration in the timetable for project completion. The United States notes that ithas not undertaken a review of whether the particular projects listed in the decree will operate to eliminate any particular violations; however, we are willing to discuss that issue with the parties. Any amended decree should state that the parties anticipate based on present information that the listed measures will suffice to eliminate violations of the Act, and that if it later proves necessary to do so the City will take additional steps not listed to eliminate those violations.

9. The United States also objects to the fee award set forth in the decree. The decree provides for an award of $100,000 in fees to plaintiffs. Decree, para. 8. The United States has not undertaken a review of the hours worked by plaintiff's counsel in connection with this matter. However, it is the understanding of counsel for the United States based on conversations with counsel for the parties that the award reflects the full amount of hours worked by plaintiffs' counsel in this matter. In view of the weakness of the injunctive relief set forth in the decree, the United States believes that an award of fees reflecting all hours worked is not appropriate. Had this case been litigated to judgment, the decree's limited relief would not warrant a full fee award. "[T]he extent of a plaintiff's success is a critical factor in determining the proper amount of an award of attorney's fees." Hensley v. Eckerhart, 461 U.S. 424, 440 (1983); see also Farrar v. Hobby, 506 U.S. 103 (1992) (finding that a plaintiff who had recovered only $1 in nominal damages was not entitled to attorney's fees); Corder v. Brown, 25 F.3d 833, 836 (9th Cir. 1994). In determining whether entry of a consent decree is in the public interest, a lack of proportionality between the fees provided for and the relief obtained is a highly relevant

consideration. A consent decree should primarily seek to redress violations of the underlying statute; the role of fees should be ancillary to that redress.

10. The decree also contains another objectionable provision. Paragraph 7 provides that the consent decree "may be pleaded as a full and complete defense to . . . any action which may be instituted, prosecuted, or attempted in breach of this Consent Decree, whether by the parties hereto, any of River Watch's attorneys, members, successors or assigns, or any third party seeking to assert rights held by the public or any member thereof." This provision appears to attempt to bar future enforcement actions by the United States or other sovereigns. As a matter of law, the United States cannot be bound by settlements of citizen enforcement actions to which it is not a party. See, e.g., Hathorn v. Lovorn, 457 U.S. 255, 268 n.23, 102 S. Ct. 2421 (1982) (the Attorney General is not bound by cases to which he is not a party); United States v. Atlas Powder Co., 26 Env't Rep. Cas. (BNA) 1391, 1391 (1987) (same); 131 Cong. Rec. 15,633 (June 13, 1985) (statement of Senator Chafee, discussing Clean Water Act section 505(c)(3), and confirming that the United States is not bound by settlements when it is not a party). Although the United States believes that this provision is without legal effect, the United States objects to it because it creates confusion as to the rights of the United States and other sovereigns. The parties have agreed to modify this provision in light of the United States' objections. Should the Court vacate its order entering the decree and order further negotiations, the provision may be modified at that time.

For these reasons, the Court's order entering the Consent Decree should be vacated, and the Court should stay proceedings and order that the parties negotiate in an effort to address the

above-referenced flaws in the Decree.

Respectfully submitted,

DAVID W. SHAPIRO
United States Attorney

JOHN C. CRUDEN
Acting Assistant Attorney General

DATED: _____

_____

PAULINE MILIUS
R. JUSTIN SMITH
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United States Attorney

JOHN C. CRUDEN
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Attorneys for United States

IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NORTHERN CALIFORNIA RIVER WATCH, INC. Plaintiff, v. CITY OF FORTUNA Defendant	No. C00-3318 CAL [proposed] ORDER GRANTING UNITED STATES' MOTION TO VACATE ENTRY OF CONSENT DECREE AND ORDER FURTHER NEGOTIATIONS DATE: January 11, 2001 TIME: 9:00 A.M. COURTROOM: 4

Upon consideration of the United States' to vacate entry of the consent decree in this action and order further negotiations and for good cause shown,

PROPOSED ORDER

IT IS HEREBY ORDERED that the motion is GRANTED. Entry of the consent decree in this matter is VACATED, further proceedings are STAYED, and the parties are ordered to resume negotiations to address the concerns identified by the United States.

IT IS SO ORDERED this __ day of _____, 2001.

_____
Honorable Susan Illston
United States District Court

Presented by:

R. Justin Smith
Attorney for United States

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing Notice of Motion, Motion, Memorandum, Proposed Order, and Notice of Appearance on the following by mailing the same, first class postage prepaid, this 19th day of October 2001:

Jack Silver
Northern California Environmental Defense Center
2312 Bethards Drive, Suite 5
Santa Rosa, CA 95405

James P. Wiezel
Kronick, Moscovitz, Tiedemann & Girard, P.C.
400 Capitol Mall, 27th Floor
Sacramento, CA 95814-4416

R. JUSTIN SMITH

ATTACHMENT F

Law Office of Jack Silver

P.O. Box 5469 Santa Rosa, California 95402
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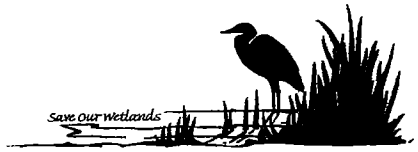
warrioreco@yahoo.com



April 12, 2006

R. Justin Smith, Attorney
U.S. Department of Justice
Environmental & Natural Resource Division
P.O. Box 4390
Washington, DC 20044-4390

Re: *Northern California River Watch v. Sonoma County Water Agency*
United States District Court Case No: C05 -3749 SC

Dear Mr. Smith:

We have received and thank you for your March 30, 2006 letter and for the continuing support of the Department of Justice with respect to the pursuit of citizen suits.

Northern California River Watch insists on the preparation and filing of consent decrees rather than private, non-court supervised settlements. It is the hope of River Watch that the Department of Justice can be proactive in urging those found to be in violation of the Clean Water Act to agree to enter into consent decrees even when the parties seek resolution of a citizen action without litigation and no lawsuit has been filed.

Thank you.

Very truly yours,

Jack Silver

JS:lhm
cc: Northern California River Watch

ATTACHMENT G

The Register-Guard (Eugene, OR)

June 23, 2007

SECTION: Pg. D1

ACC-NO: 166073627

LENGTH: 1132 words

HEADLINE: Agencies settle sewage lawsuit;
Courts;
Officials agree to scrutinize waste programs and pay $120,000 to two attorneys

BODY:

Byline: Jack Moran The Register-Guard

Local public agencies have agreed to take a closer look at their sewage management programs and pay a pair of lawyers $120,000 to settle a lawsuit the attorneys filed on behalf of a newly formed local environmental group.

The suit filed last year in federal court by Eugene-based Oregon RiverWatch alleged that the cities of Eugene and Springfield and the Metropolitan Wastewater Management Agency allowed raw sewage to seep into area waterways in violation of the federal Clean Water Act.

The settlement agreement approved this week by officials for all three agencies does not force local governments to make any sweeping changes to their sewage piping and treatment programs.

Attorneys for the local public agencies deny Oregon RiverWatch's allegations and say they agreed to settle the case because it was far less expensive than contesting the charges at a federal court trial.

"We're only settling because it's the cheapest way out of this litigation for our (sewer) ratepayers" in Eugene and Springfield, wastewater commission attorney Dave Jewett said. "It's important for the public to understand that we don't think we violated the Clean Water Act."

Adding up the settlement plus legal fees and other costs, the local agencies will have spent more

than $400,000 on the lawsuit.

The settlement doesn't address the lawsuit's two major allegations:

The Oregon RiverWatch lawsuit specifically mentioned six instancesin which manholes in Eugene and Springfield overflowed with sewage when underground lines became blocked or system pumps failed.

The incidents, the suit alleged, tainted local creeks and streams and constituted Clean Water Act violations. The overflows were reported by local officials to the state Department of Environmental Quality, which regulates the local agencies and enforces the Clean Water Act. In none of the cases cited in the lawsuit did the state reprimand local agencies for illegal discharges.

The suit also claimed that raw sewage was oozing from underground pipes throughout the metro area and making its way into waterways. The lawsuit did not name specific locations.

Jewett said that even if the local agencies had prevailed at a trial, chances were slim they could have recovered attorney fees from Oregon RiverWatch, which as a newly formed nonprofit group most likely has few assets.

The wastewater commission, which is funded primarily by Eugene andSpringfield sewage ratepayers, has paid its attorneys about $172,000to fight the case. Springfield has spent nearly $70,000 on its legalfees, city spokesman Niel Laudati said. Jens Schmidt, a Eugene city attorney, would not disclose the amount spent by Eugene.

The commission runs the metro area sewage treatment plant. The cities operate their own sewage piping systems that channel waste to theplant.

The settlement agreement requires the cities and the wastewater commission to each designate an existing employee as the person for ensuring their agency is complying with its state-issued sewage discharge permit.

Also, the settlement requires an outside audit of the regional sewage treatment plant in Eugene before the end of this year. Peter Ruffier, wastewater division director for the city of Eugene, said an audit was completed in 2005.

Performance audits of the plant, which treats area sewage before discharging it into the Willamette River, are typically done every four to five years, Ruffier said.

Ruffier and Jewett characterized sewage system changes required bythe settlement as insignificant.

"Much of this is already being done," Jewett said. "There may be some minor adjustments. Are these changes significant? I don't think so."

The agreement also calls for the cities and the wastewater commission to pay $65,000 to the

Long Tom Watershed Council for a restoration project aimed at improving water quality in Amazon Creek or Long Tom River, council coordinator Dana Erickson said. The specific projecthas not yet been chosen.

The primary payment the public agencies will make as a result of the settlement agreement is to Oregon RiverWatch lawyers Roy Haber of Eugene and Jack Silver of Santa Rosa, Calif. The duo will split $120,000 in attorney fees.

Silver did not return a phone message left Thursday at his office.Haber declined to comment on the settlement when contacted Friday.

Oregon RiverWatch board President John Bergland of Eugene did not return a message left Thursday at his home.

The settlement bars the nonprofit group from suing the cities or the wastewater commission for Clean Water Act violations for 10 years.

The group filed the complaint under a provision of the Clean WaterAct that allows citizen lawsuits. Silver, the founder of a group called Northern California River Watch, has sued about a dozen local governments in his home state in cases similar to the one in Lane County. In the process, he has collected more than $660,000 in attorney fees from settlement agreements with local agencies since 2002. The settlements often include requirements that public agencies improve sewermaintenance and pay for environmental studies. The size of the attorney fees have led critics of Silver in California to allege that he is abusing the federal law's citizen lawsuit provision.

Wastewater commission attorney Jewett declined to speculate on whyOregon RiverWatch attorneys filed the lawsuit, then agreed to an out-of-court settlement that does not directly address the major allegations in the complaint.

"I don't think I should characterize their motivation," Jewett said. "I do think that their case did not have much merit."

Jewett said the case is not technically closed because a U.S. Department of Justice attorney told a federal court judge that he intendsto object to the settlement because the federal Environmental Protection Agency wants the agreement to require that the wastewater commission complete upgrades to the treatment plant by 2010, to prevent sewage overflows into the Willamette River during heavy storms.

Jewett said the wastewater commission has already made a commitment to the state Department of Environmental Quality that the improvements will be completed by 2010, and that the federal government's demand would be unnecessary.

The state agency "is who we answer to," Jewett said. "We don't think we need an additional oversight layer."

U.S. District Judge Ann Aiken could ignore the federal government's request and declare the case dismissed. But she could rule that theobjection is valid and opt not to dismiss the lawsuit, said Eugene attorney David Wade, who was hired by the city of Springfield to represent it in the Oregon RiverWatch case.

"There is a little uncertainty for what the court will do," Wade said. "I personally think it would not derail the settlement. However,it's up to Judge Aiken, not me."

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